THE TEXTILE MANUFACTURER

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Notes of the Month

WORLD TRADE IN COTTON, ETC., YARNS AND FABRICS

COTTON yarn output in 1960 in those non-Communist countries for which regular figures are available, including all the major exporting countries, was about 4% greater than in 1959 and established a new record level, according to the latest Cotton Board quarterly statistical review. The biggest increases compared with the previous year were achieved by Japan and France, but all the important textile producing countries shared in the expansion with the exception of the U.K., the U.S.A., Canada and possibly Sweden.

It is clear, says the review, that the global rate of cotton yarn production passed its peak sometime during last year. In the third quarter, total output was only about 2% greater than in the corresponding period of 1959, and in the fourth quarter it was about 2% less than a year earlier. Production in the U.S.A. was very much smaller than in the final quarter of 1959 and U.K. output was also running slightly below last year's level. Japanese, Indian and Canadian production was greater than a year earlier and so was that of most continental European countries except Belgium.

World trade in cotton piece-goods expanded notably in 1960 for the second year in succession. Exports from non-Communist countries were about 11% greater than in 1959, the only important exporting countries not to share in the increase being the U.K., U.S., India and Switzerland. The biggest increases in shipments compared with 1959 were recorded by Japan, France and Spain. The expansion in world trade clearly levelled out and may even have been reversed during the year, however, since exports in the final quarter were no greater than in the final quarter of 1959. Comparing the two periods some striking contrasts are revealed, notably a large increase in shipments, from Japan and a large decrease in shipments from India.

Other countries to export smaller quantities of cotton cloth in the last quarter of 1960 than a year earlier were the U.K., U.S., Switzerland and possibly France. Exports of man-made fibre piece-goods from non-Communist countries in 1960 were much the same in total as in 1959 after declining for two successive years from the record 1957 level. The only countries to increase this trade in 1960, however, were Italy and Japan. The recovery was mainly concentrated in the final quarter of 1960, when total exports from non-Communist countries were about 6% greater than in the corresponding period of 1959. As for the year as a whole, this increase seems to have been virtually confined to Japan and Italy.

The rate of output in the U.K. cotton industry in the first two months of this year was markedly lower than last autumn. The two main reasons were the reduction in the standard working week from 45 hours to 42½ hours as from the middle of January, and wide-spread absenteeism because of illness. Single yarn output in February was 7% below the November level. The biggest fall proportionately was in spun man-made fibre yarns, the trade in the very coarse yarns for tufted carpets still being relatively depressed.

The daily rate of cloth output in January, adjusted for holidays, was about 5% less than the level reached last October, which was the best month since the completion of scrapping under the Reorganisation Scheme. The rate of output of continuous filament rayon fabrics in January was actually greater than in October, but in contrast there were quite sizeable decreases in the rate of output of heavy cotton canvas, tyre fabric, synthetic fibre fabrics and cotton/man-made fibre mixture cloths. The doubling section is still very depressed. The rate of doubled yarn output (in terms of weight) in February was 8% less than in November and as much as 16% less than in May, 1960.

Since October new orders have been coming in rather slowly to the mills and order books have been shortening. With the notable exception of the doubling section, however, order books in general remain long and deliveries have been well maintained. Retail sales of clothing last year, corrected for price changes, were as much as 7% greater than in 1959, and in the final quarter of 1960 they were still as much as 5% up on the corresponding quarter of the previous year. The corresponding rate of increase compared with a year earlier in January this year was about 2 - 3%, which may indicate a slight decline compared with the fourth quarter of 1960 on a seasonally adjusted basis. This is still a very high level of retail sales, however, and represents a major source of strength for the cotton industry.

The main weakness in the situation is the increase in stocks of cotton goods brought about by the flood of imports. Imports of cotton piece goods reached a new record level of 195 mn. sq. yds. in the final quarter of 1960, with increased quantities entering the country from Pakistan, Hong Kong, Canada, the U.S., Yugoslavia, Formosa, Spain, Portugal and a large number of Western European countries and only India sending substantially less than in previous quarters. Imports of cotton piece-goods in

"TEXTILE MANUFACTURER" INDEX

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January and February totalled as much as 144 mn. sq. yds.

Exports of cotton yarn, cotton piece-goods and man-made fibre piece-goods were all smaller in 1960 than in 1959. Exports of cotton piece goods totalled 81 mn. sq. yds. in the fourth quarter of the year compared with 74 mn. in the third quarter and 96 mn. in the fourth quarter of 1959. British West Africa, French Africa, the Irish Republic and Indonesia were the only sizeable markets to show increases compared with a year earlier.

Shipments to almost all other destinations were smaller, the decreases in exports to the Congo and Rhodesia and Nyasaland being particularly substantial. Exports of man-made fibre piece-goods were also considerably smaller in the fourth quarter than a year earlier, the decline being spread over the main markets.

PROGRESS IN JUTE INDUSTRY

THE jute industry had never been so well equipped to fulfil demands made on it, said Mr. N. W. Campbell, chairman, at the recent annual meeting of the British Jute Federal Council. He said a further sum of £843,000 had been spent on modernisation and re-equipment during 1960 and there were now no "old type" spindles in operation and up-to-date automatic and non-automatic looms continued to be installed. Within Dundee itself, a total of £12·2 million had been spent in the post-war modernisation programme. In addition to technical change, new ideas on management, training and selling were constantly being developed against a background of scientific research.

Home output in 1960, he said, was higher than in the previous year, despite a weak finish. The effect of international uncertainties and the high price of raw material was being felt. During this high-price period the jute industry of this country has shown great restraint in holding prices for manufactured goods below current raw jute levels. Mr. Campbell said the latest available information on the new crop of jute was favourable, and sowings were being made freely. They must hope for good growing and harvesting conditions to produce the large crop necessary to meet needs. Disposals of imported jute goods in the U.K., he reported, had shown little change in 1960 compared with the previous year.

Referring to appeals to British industry to increase exports, Mr. Campbell said there had been an "appreciable increase" in direct exports of jute manufactures last year to extremely competitive markets overseas. It was still true, however, that their major contribution to export-earnings was an indirect one, in that many goods leaving these shores had quality jute yarns and fabrics as a component part.

At the recent annual meeting of the Dundee Jute and Linen Goods Merchants' Association, Mr. A. S. Kyle, retiring chairman, also spoke of the jute position. He pointed out that the primary cause of fluctuations in the prices of jute goods for some years had been the raw jute market. "While it is easy to say that nature is at fault," he said, "the world jute trade cannot afford undue price movements which dislocate our markets. Common sense suggests that jute interests cannot flourish in emergency situations which keep repeating themselves.

"Yet our search for stability is not an easy one in view of the varying political policies of countries concerned. My hope is that out of the present crisis, which fortunately is only a temporary one, will come the answer to the problem. Jute-growing countries can be assured that sound actions designed to bring some measure of stability to the raw jute market at reasonable price levels will have our active support."

Mr. Kyle said that export figures on the whole had been well maintained but there was still a tendency for certain countries to adopt policies which worked to the detriment of the exporter of jute goods.

NEW CARGO RATES FOR TEXTILES

BRITISH textile exporters will benefit from new rates introduced by B.O.A.C. for cargo flown between the U.K. and the U.S.A. Textiles sent by air already have the benefit of special commodity rates and these are to be still further reduced. At present the cost for consignments from London, Manchester or Glasgow to New York is 5*s.* 2*d.* (72 cents) a kilo for 45 kilos and over. The new rate will be 5*s.* 2*d.* a kilo for consignments of between 45 and 249 kilos, but the whole consignment will be rated at 4*s.* 6*d.* (62 cents) a kilo, if it weighs more than 249 kilos. This rate will apply to yarn, thread, fibres, natural and synthetic; cloth exclusively in bales, bolts or pieces, not further processed or manufactured; hat bodies, drawnwork, needlework, embroideries, tulle; handkerchiefs, and lace; textile manufacturers' articles or materials made principally of textile and parts thereof but excluding clothing and footwear, outer and under-garments. This special rate for textiles is one of a series of sweeping reductions for air freight being proposed by B.O.A.C. The new rates specifically refer to U.K./U.S.A. traffic only.

EMPIRE COTTON GROWING CORPORATION

AT the recent annual meeting in Manchester, Lord Derby, as president, drew attention to the current annual production of 1½ million bales of cotton in the eight countries in which the corporation worked, a three-fold increase since the war. After briefly reviewing the work of the past 40 years, Lord Derby said the corporation's object, both now and in the future, was two-fold: to help to increase cotton production still further by research and experimentation and to help to train local staff to play a larger and larger part in this work. To further the second objective the May memorial scholarship had recently been introduced, the first award being to a member of the Department of Agriculture in the Sudan, who was to start a year's post-graduate course at Cambridge in the autumn. It was particularly gratifying that at a recent meeting in Africa representatives of the two independent countries, the Sudan and Nigeria, had not only thanked the corporation for its help in the past but had stated that this help, probably on an increasing scale, would be needed for many years to come.

Mr. J. Littlewood, chairman, referred to the fact that outside growths such as Nigerian commanded a premium over U.S. cotton of similar staple and comparable grade, because they were still hand-picked and did not suffer the disadvantages of mechanical picking and cleaning. A highly organised system had been established at every stage in the production and sale of cotton in the eight countries in which the corporation was glad to participate. The good quality and high standing of these cottons were ensured by pure seed, recommendations for cultivation practices based on scientific experiments, regular inspection of ginneries, and the great care devoted to classification by the marketing boards.

Drafted Styles for Ladies' Coatings

Even where a designer is only concerned with dobby looms some very elaborate designs can be achieved by using warp and weft faced weaves together in novel constructions

By W. H. D.

IN the production of large pattern effects for ladies' coatings considerable ingenuity is required by the designer who, by force of circumstances, only has dobby looms at his disposal. By the use of warp and weft faced weaves together, and with certain warp ends working as key threads, arranged in regular order, and weaving with a minimum number of shafts to form the ground of the pattern, it is possible to produce very elaborate designs. Some of the effects give the appearance of having been woven in a Jacquard loom, but actually, they are elaborately drafted styles.

Fig. 1 illustrates a full point paper design which is complete on 60 ends and picks. It could be made in a warp of 10s York skeins with 18 ends/in., 70 in. wide to finish 56 in. Weft 10s York skeins, 18 picks/in. The repeat in the finished cloth will be approximately 3 in. and it can be woven on 14 shafts.

On examination of the design it will be noticed that the ground and figure work are formed by warp and weft faced weaves, and these two weaves "cut" perfectly wherever they are in contact with each other. The ground being a 2/1 warp face twill and the figure a small hopsack effect made from a 2/1 weave with weft predominating.

The draft Fig. 2 shows that every third thread i.e. 1, 4, 7, etc. is drawn through shafts 1 and 2, and work in the same order throughout the design and forms in the fabric a regular running foundation. It will be observed that these threads represent the first end of 2/1 warp face twill, and at the same time form the main part of the hopsack figure. The remaining threads in the draft are drawn through the other 12 shafts in groups of 2s, each group being repeated twice, and these together with the foundation threads give complete sections of 6 ends and picks each. In this example ten sections cover the full design. It will be seen in Figs. 3(*a*), (*b*) and (*c*) that three distinct effects can be produced by working in this manner i.e. 2/1 warp face twill to right; 2/1 warp faced twill to left and 2/1 irregular hopsack (weft faced).

When developing these designs a small "basic" sketch effect on 10 ends and picks is made on point paper as in Figs. 4(*a*), (*b*) and (*c*). Each small square in the basic design represents 6 ends and picks. We may then let the solid squares of these designs be represented by Fig. 3(*a*) and the blanks be represented by Fig. 3(*c*).

On careful examination of the three weaves Figs. 3(*a*), (*b*) and (*c*) it will be noticed that certain key threads are common to all three, viz. the 1st and the 4th warp ends work 2 up and 1 down while each third pick works 1 down 2 up, horizontally. Advantage can be taken of this fact, when constructing the pegging or weaving plan. The first two shafts which carry every third thread in design can be made to weave 2 up and 1 down throughout, whilst every third pick in plan can be lifted as shown by 1. All that is necessary now to complete the weaving

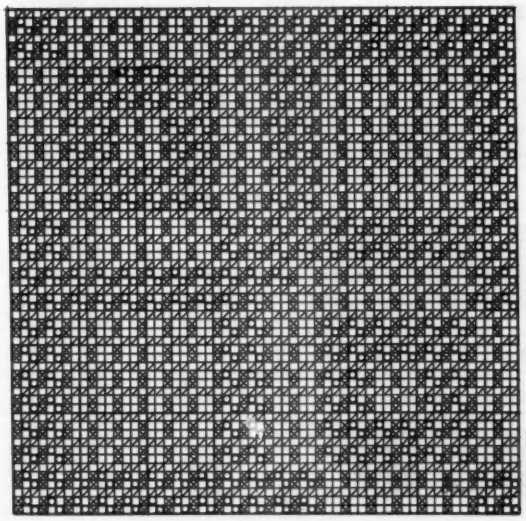

Fig. 1 is complete on 60 ends and picks

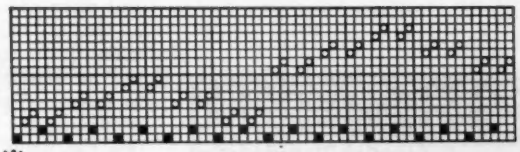

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Fig. 2.

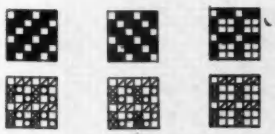


Fig. 3(a). Fig. 3(b). Fig. 3(c).

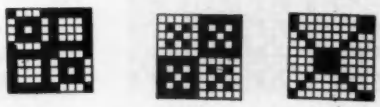


Fig. 4(a). Fig. 4(b). Fig. 4(c)

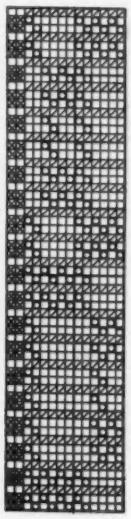


Fig. 5.

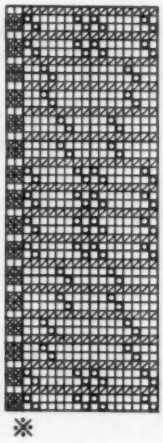
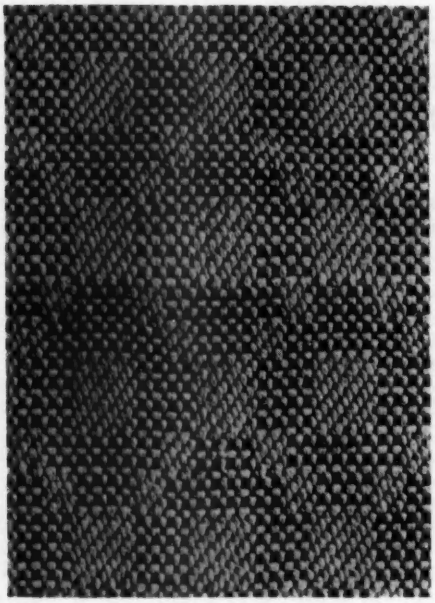


Fig. 7.



(centre) Fig. 8.

(right) Fig. 10.

plan is to follow the small squares of the "basic" sketch and insert plain weave for solid squares starting miss 1 peg 1 on first pick on each remaining pair of ends and picks, if ground is required to show 2/1 warp faced twill to right.

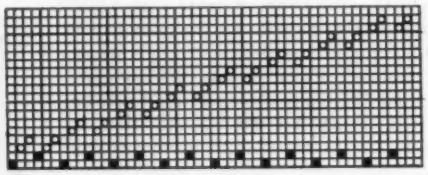


Fig. 6.

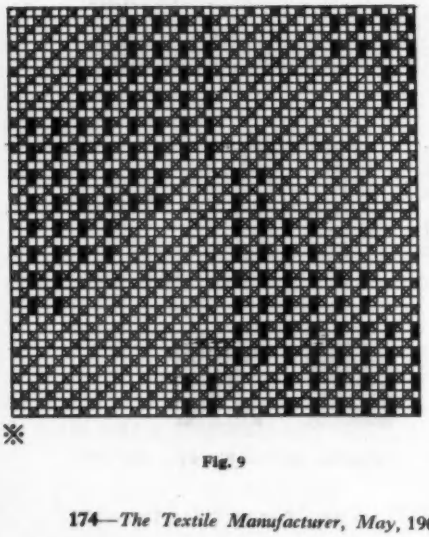


Fig. 9

Warp Face Twill

If 2/1 warp face twill to left is required the two ends and picks of plain weave should start peg 1 miss 1 on first pick. The blanks in "basic" sketch are represented by leaving each corresponding pair of ends and picks blank. To complete each 6 ends and picks of design each square of "basic" sketch should be duplicated vertically. The complete weaving plan for "basic" sketch Fig. 4(*a*) is shown at Fig. 5.

To obtain greater scope in the designing of these fabrics, the draft should be arranged as shown in Fig. 6 where again, each small square of "basic" sketch represents 6 ends and picks as before. Fig. 4(*c*) shows a "basic" design on 10×10, and using draft Fig. 6 the weaving plans can be quickly produced by working as described previously, and without producing the full point paper design (see Fig. 7). Fig. 8 illustrates a fabric woven on this method.

A further principle of this method of working is shown in Fig. 9. Basic weave in this example is 1/2 weft faced twill. Note that two thirds of the total ends in the warp are again drawn on the front two shafts. Remaining warp is drawn in odd threads repeated twice thus forming with the foundation threads, sections of 6 threads, giving in the complete draft eight variations over the full repeat of 48 threads. Fig. 9(*a*).

Weaving Plan

When constructing weaving plan, the 1/2 order is run on the first two shafts and marks 1 are placed on every third pick, as shown in Fig. 9(*b*). Fig. 9(*c*) is "basic"

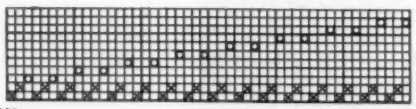


Fig. 9(a)

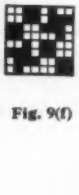


Fig. 9(f)

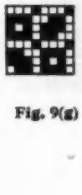


Fig. 9(g)

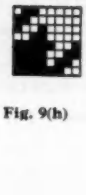


Fig. 9(h)

(right)
Fig. 9(b)

Fig. 9(c)

Fig. 9(d)

Fig. 9(e)

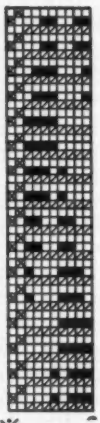
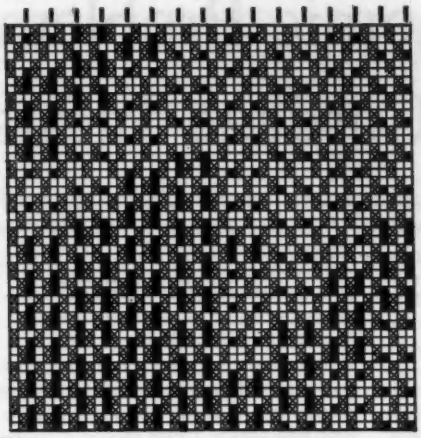


Fig. 9(b)

sketch. Fig. 9(*d*) and 9(*e*) are the two base weaves. Fig. 9(*d*) is used for blanks of Fig. 9(*c*) and Fig. 9(*e*) is used for solids of Fig. 9(*c*). To complete the weaving plan, marks are placed on the second of every group of three picks, to correspond with the marks of "basic" sketch.

Figs. 9(*f*), (*g*) and (*h*) are further examples of "basic" sketches which could be woven on draft, Fig. 9(*a*). Using draft Fig. 9(*a*), a further development of this principle may be employed. In this case the two ground ends and picks work 2/2 warp cord throughout whilst the third thread of each group of three works 3/1 irregular cord. Fig. 10 shows a fabric woven on this principle. Fig. 11(*a*) Design, Fig. 9(*h*) "basic" sketch and Fig. 11(*b*) weaving plan. The warp threads drawn through the back shafts may be coloured as shown in Figs. 10 and 11, the long floats would give greater contrast than if only one colour was used.



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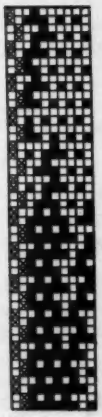
(left) Fig. 11(a)

(right) Fig. 11(b)



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Manufacturing particulars for fabrics. Figs. 10 and 11.

Warp 7½s Yorks skein white
6s Yorks skein black gimp (worsted "Fibro") 1
70 in. wide in loom.
Reed 8 dents/in., 2 ends/dent.
Picks per in. = 16
Weft 7½s Yorks skein, all white
Weight per square yard finished = 13/14 oz.

New Portable or Static Blending Machine

BY standardising the mechanism, a new blending machine which can be incorporated in a portable or wall-mounted unit has been produced by Suba Hydraulics Ltd., Limes Place, Limes Road, West Croydon, Surrey. This unit will bring any two liquids together and deliver in a pre-arranged proportion through a diffuser chamber just prior to delivery. The settling out problems usually associated with storage vessels are thus eliminated.

By using one liquid under pressure as a constant factor the second liquid can be added to give a proportion from 5% to 40% of the total output. All liquid handling cylinders are in brass; end castings, pistons and valves are in bronze and the pipes and fittings are copper and galvanised steel. The tanks and cover are mild steel, all welded. The inside of the tank is treated with alcohol resisting dressing and the outside of the tank and non-moving parts are finished hammer blue, with hoses in clear vision braided nylon. This company also produces machines for blending a number of liquids to suit individual requirements.

New Publications

OPPORTUNITIES FOR QUALIFIED MEN.—Cornmarket Press Ltd., Darley House, 1, Lower James Street, London W.1. The 1961 edition of this valuable directory points out that amongst industrial companies recruiting qualified men and women, the demand is highest for mechanical engineers. Out of over 140 companies who give their recruitment requirements in the reference section of the directory, 67 needed mechanical engineers. The categories next in demand were physicists, for whom 53 companies have vacancies, electrical engineers—needed by 55 organisations—and chemists, for whom 48 companies have vacancies. 30,000 copies of the directory will be distributed this year, free, to newly qualified men and women. Its purpose is to provide them with a clear and extensive picture of the openings available during the coming year.

FABRIC AND CLOTHING TRADES INDEX, 1961. Fabric and Clothing Trades Index Ltd., 299 - 301 Gray's Inn Road, London, W.C.1. (price 42*s*.).

Familiarly known as Facti, this reference book now appears, much enlarged, in a form designed to withstand the handling it will inevitably receive and with the addition of index card tabs for easier usage. The directory sections cover manufacturers of fabrics, clothing, leather goods, furs, millinery and hats, supplemented by a 55-page list of branded names and a new section indicating overseas suppliers.

The editorial articles are by Lord Mancroft (Nylon); J. W. Nowell (Leather Clothing); Kate Wharton (Wool in Fashion); and Ruth Stewart (Italian fashion and fabrics) together with a review of advances in the home market and the export field by A. T. Elvy.

Economic Problems of the Cordage Industry

Modern developments in the design of hard fibre processing machinery have followed generally on the lines of those which have proved successful in similar units for processing bast fibres in the cordage industry

By S. A. C. CALDWELL, F.T.I.

Although fulfilling a less spectacular role than many other products of the textile industry, those of the cordage trade—ropes, nets and twines—have been, and still are fundamental to commercial development. How much, may be assessed from the fact that world output of hard fibres alone, which provide only part of the industry's raw material requirements, was in the region of 790,000 tons in 1959. To this must be added the considerable consumption of bast fibres—flax, hemp and jute—as well as cotton and man-made fibres.

The quality and cost of raw material were formerly closely related to fineness and quality of end product. Since the war, however, the change in relationship of raw material values, represented by the much steeper advance in certain fibres compared with others, has resulted in more widespread use of the higher grade fibres, cotton, flax and man-made. For example, Table 14, "Indices of Industrial Fibre Prices in the United Kingdom", in the 1960 edition of "Industrial Fibres Review," compiled by the Commonwealth Economic Committee, gives the following change in relative values.

	1934-38 average	1959 average
Cotton (American)	31	105
Rayon	66	147
Flax	33	60
Sisal	28	119
Jute	21	105

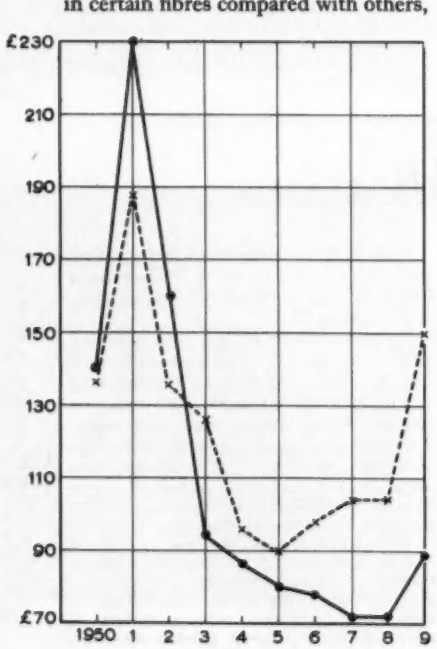
1947=100. (except Flax: 1952=100)

This shows the steepest advance to be in sisal and jute. As the former is strongly competitive with other hard fibre raw materials of the cordage industry not specified in the Table it may be assumed that the advance on pre-war values of these has been comparable.

Raw Material Costs

A considerable percentage of the natural fibre raw materials of the cordage industry is produced in countries with an ample low cost labour force. In these considerable effort is now being made to raise the standard of living. This will entail a rise in wage levels which will automatically increase production cost, unless offset by economies in handling Compared with cotton, flax, soft hemp and jute, all of which are annual crops, with production and handling in most instances highly mechanised, manila and sisal are products of plants which take some years to attain maturity and continue as a source of fibre over several seasons. Harvesting from these is mostly a manual operation with little prospect of any substantial measure of mechanisation, so that labour cost is likely to continue to represent a substantial part of the total selling price, with little possibility of an appreciable reduction in the forseeable future. In fact the trend is more likely to be in the other direction.

Raw material values represent a substantial percentage of the cost of end product over the whole range of output, and as the market is becoming increasingly competitive by the introduction of substitutes, and by the use of alternative means of handling where twine and fine cordage has hitherto been used for packaging both in indus-

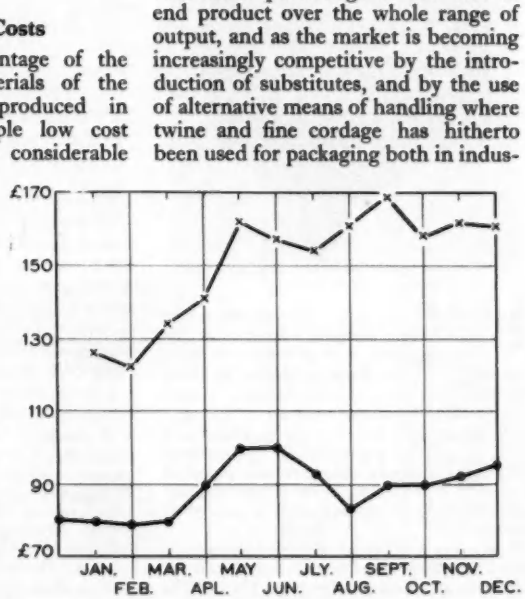


(left) Fig. 1. Average price per ton for British East-African sisal No. 1 and abaca/manila, grade J2

— • — • — Sisal No. 1

- - x - - x - - Manila J2

(right) Fig. 2. Monthly average for the same grades during 1959



try and in agriculture, fluctuations in market values have an important bearing on demand. That these have been frequent and often considerable is evidenced from the graphs in Figs. 1 and 2. Fig. 1 shows the average price per ton for British East African sisal No. 1, and abaca-manila grade J2, over the ten years 1950 to 1959 inclusive. The graphs in Fig. 2 show the monthly averages for the same grades during 1959. The peak values during the years 1950-52 inclusive were consequent on devaluation of sterling in 1949 and the Korean War. The progressive downward movement in sisal prices continued until 1959, when a sharp rise took place with considerable fluctuation of values throughout the year. The movement of manila was more erratic during the period, but a substantial rise was also recorded in 1959.

While manila still occupies premier place for the manufacture of high grade ropes and cordage it is being seriously challenged in this sphere by sisal and man-made fibres. In the first instance because of lower price and improvement in quality. This is evidenced by the change in relative proportions of each in the world output of hard fibres, recorded by Guillebaud in his recent survey of the sisal industry of Tanganyika. The annual production of each fibre is stated as follows:—

	Manila	Sisal
1935-38 average	165,000	250,000 tons
1956	128,000	486,000 tons
1957	126,000	495,000 tons

Consideration is now being given to the possibility of reducing raw material costs by extending the spinning range of the lower grades of fibre through improved methods of production and/or modifications in standard manufacturing practice. The difference in market value between the top and bottom grades of sisal is in the region of 15 - 20%, while that between sisal and manila may range from 10 to 50%. There is consequently ample opportunity to reduce production cost and selling price of end product by upgrading the lower quality materials, in manufacture, provided this can be effected economically.

The value of nylon as a cordage fibre was recognised, and its use for this purpose was extended during the war time emergency, when its properties of strength, resistance to moisture, rotting and wear made it particularly suitable for many specialised requirements of the services, and opened up new fields for future development in competition with natural fibres. In the immediate post-war years low output and high cost limited its use in the cordage industry. Subsequent expansion of production together with a reduction in cost has helped to bridge the gap to an extent that has made nylon and other man-made fibres directly competitive with flax, cotton, hemp and manila in the manufacture of the higher grade end products of the industry.

When cost comparisons are made on performance, which is the only acceptable basis, the scale is invariably tipped still further in favour of man-made raw materials. The fact that these can be constructed to specification, and frequently tailored to a specific end use, gives them a considerable advantage over natural fibres, which vary considerably in their physical and chemical properties, and are to an extent unpredictible regarding performance in manufacuture and in end use. Comparison of nylon and manila ropes of similar size showed that the former was capable of lifting a load almost double that of the latter, while tests indicated that its resistance to abrasion was also several times greater than that of the manila product.

Investigations on sisal crop production have been concerned more with fibre yield and economic life of plantations than with quality of output. The sisal fibre filaments range from 3 to 6 feet in length, being composed of ultimates varying from 1·5 to 4·0 mm. in length and 20 to 30 microns in diameter. They are polygonal in cross section. Each leaf yields from 2 to 4% dry fibre which varies from white to pale yellow in the best grades, usually deepening in colour as the quality declines.

Extraction and Spinning Quality

With an efficient system of extraction the fibre is practically free of leaf tissue. Suppleness is related to the degree of lignification, which increases with the age of the leaf when cut and also with the age of the plant. Young leaves from old plants yield fibre with a higher degree of lignification than is found in leaves of similar age which have been cut from younger plants. As brittleness and harshness are evidence of high lignin content, and are closely associated with spinning quality, early cutting is desirable though this is detrimental to yield.

Various treatments have been tried to improve the spinning quality of sisal, to permit extension of the yarn count range and make the end products competitive with those made from more expensive raw materials, especially hemp and manila. This usually involves one or more of the following treatments:—

(1) Mechanical softening.
(2) Impregnation with softening agents.
(3) Chemical treatment.

Mechanical softening is effected by passing the material between a sequence of pairs of fluted rollers which exert a kneading action. It may be increased further by extending the sequence of hackling and drawing operations, though this adds considerably to manufacturing cost, and the expense of extended processing must be carefully weighed against the benefits obtained. A softening attachment comprising six pairs of heavily fluted rollers may be mounted at the feed end of the No. 1 Goods machine. This unit is usually fitted also with a batching apparatus mounted over the feed section for application of a suitable softening and lubricating liquid to the fibre.

Batching liquids usually consist of a mixture of water and oil, or other lubricating agent, applied in the form of an emulsion in combination with a suitable emulsifying agent, usually a proprietary brand designed for the purpose with special reference to the batch ingredients. Batching is an important factor in the spinnability of hard fibres and the preparation of appropriate batching emulsions has been closely-studied by firms, such as the Amoa Chemical Co. Ltd., which specialise in their production. These two treatments, mechanical softening and batching, have been provided for in standard processing systems. While effective they are capable of only a limited extension of the spinning range.

Recent investigations have centred on ways and means to extend the spinning range of the cheaper raw materials used in cordage manufacture by chemical treatment. B.P.541,383 relates to a process for the treatment of sisal and similar hard fibres to soften them sufficiently so that they can be spun into yarns suitable for canvas and other heavy fabrics. The raw material is first boiled for approximately four hours in a dilute aqueous alkaline solution. This is followed by a chlorination treatment and by washing. The material is then treated with a tertiary amine, after which it is washed and a softening oil applied.

B.P.555,606 relates to the treatment of sisal to produce a softer and finer fibre without any appreciable loss of

weight, strength or colour. This can be effected on an economic basis. The decorticated fibre is treated at room temperature in a bath of weak caustic alkali containing a calcium compound, so that the organic silicic acid combination in the cell wall is destroyed without appreciable removal of the non-cellulosic gums. One part of sisal is immersed in five parts of caustic soda solution of 1 to 4% concentration, containing a mixture of calcium hydrate and sodium zincate or aluminate 0·05% at ordinary temperature and pressure for a period varying from 2 to 24 hours. On removal the fibre is squeezed to extract excess liquid, washed, and then steeped in an aqueous emulsion of spindle oil. The treated material is very absorbent and dyes more solid colours. The yarn can be spun to finer counts and is not hairy. Unlike the ordinary sisal fibre it can be made up into polished twines and lines.

Because the market for end products has not yet passed saturation point the profit margins generally can absorb the consequences of a certain measure of inefficiency in production which exist in many manufacturing plants, due to faulty layout and the operation of obsolete machinery. Many cordage works in operation to-day have a history stretching well into the last century. They have expanded piecemeal with the demand for their products and not in accordance with a pre-conceived plan to ensure an economic layout. Bottlenecks exist which hamper output and add unnecessarily to labour costs. Much machinery still in operation, while well maintained and functioning efficiently within its capabilities, is obsolescent. The increasing pressure of competition demands, in some instances, the introduction of new processing techniques with modern equipment to make them effective.

Modern developments in the design of hard fibre processing machinery have followed generally in the lines of those which have proved successful in similar units for processing bast fibres in the cordage industry. These have included improved methods of gill bar driving to permit higher speeds and the use of shorter drafts. The latter helps to eliminate lumpiness, or "birds nests", in the yarn and ensures a superior end product.

Modern Goods machines are designed with a reach to suit the material they are intended primarily to work, a longer reach being required for manila than for sisal and maguey. Not infrequently the practice is to use long reach machines for all staples. This is detrimental to the shorter fibres, resulting in a more irregular yarn. As previously stated the addition of a softening attachment comprising six pairs of fluted rollers at the feed end of the No. 1 Goods machine ensures better breakdown of some raw materials and more uniform drafting.

The practice of using one or two Goods machines for a sequence of three or four runs is undesirable in large units where bulk production makes the operation of a full sequence of properly graduated units an economic proposition.

Drawing and Spinning

On the Goods machines, as also on the succeeding drawing frames the reach should be appropriate to the material to be worked, that for sisal being shorter proportionately than for manila. The preparing sequence includes 3 to 5 screw gill drawings, according to the yarn quality required 5-drawing systems are frequently used for the manufacture of binder twine. While the Goods machines or draw frames have not changed fundamentally in design or in principle of operation many minor modifications and attachments are included in present models, which contribute to improved performance and lower operating cost.

Comparison of the modern automatic gill spinner with the older automatic spinner, or jenny, for the production of hard fibre yarns shows many factors favouring the former, including quality of end product and cost of production. The auto-doffing gill spinner combines greater production with higher working efficiency. It requires a smaller floor area than that necessary to accomodate the number of jennys to give an equivalent output. Also, the superior pinning properties of the screw driven gills, and the shorter nip, ensures better control of the fibre during drafting, producing a stronger and more level yarn. A considerable saving is effected in direct labour cost on the gill spinner, as one operative can attend two 24-spindle machines. Being fitted with automatic doffing mechanism the cost and time required for this operation is reduced to a minimum.

Automatic spinners possess certain advantages which have ensured their continued use to a limited extent. These include adaptability for the manufacture of a wide range and variety of yarns; a greater number of yarn weights and qualities can be produced simultaneously on a plant of similar capacity, due to the smaller spindleage—from 2 to 6—on each jenny. The power consumption per spindle is also substantially lower on the latter machine. On this also the nipper die has a controlling action on lumps or "thicks" in the sliver, which produces a more level yarn.

Replacing Older Machines

In the house rope making machine section modern practice favours the use of two separate machines, a strand former and closer or layer, for the complete operation. These are gradually replacing the older type machine which combined the two processes on the horizontal unit for ropes up to 2½ ins. circum., extending the range up to 3½ ins. circum., on the vertical machine. The combination of these two operations involves both constructional and operational problems, which increase with the size of end product being made.

The stranding machine may be constructed as a single or double unit, the flyers being positioned horizontally as on the spinning jenny. The supply bobbins are mounted on a creel opposite the twist tube end of the machine, the ends being drawn through a register plate to ensure correct positioning in the strand. With this method of supply the yarn bobbins can be changed without stopping the machine, as is necessary with the compound unit. It combines also the merits of low capital and labour costs with high productive capacity. House machines comprising separate stranders and formers are now available to make the largest size ropes in ordinary use.

The relative merits of ropes and cables made on the house machine and on the rope walk are still matters for controversy which centres round cost of production and quality of end product. While the merits of the house machine method are generally conceded for ropes up to 3 ins. circum., many rope makers contend that for heavier products—with certain exceptions—the ropewalk is preferable from both viewpoints of quality and cost However, the fact that a demand exists for house machines to make heavy products proves that opinion is by no means unanimous. Considerable improvements embodied in newer models have eliminated shortcomings and house machines continue to supply an increasing volume of the demand for ropes of all sizes.

Work Study in a Woollen Mill Mending Department

An average work value can be allocated per piece for handling, knotting and perching. For the purposes of assessing work value, each separate warp end down, or pick broken or missing, is considered one mend

By "TEXTILE TECHNOLOGIST"

THIS report covers investigations made in the mending department and contains proposals for applying a production bonus scheme to replace the fixed piece rate per piece mended which can often prove troublesome. It is not considered possible to make any appreciable increase in productivity by virtue of alterations' in method. Most pieces, as mended at present, are drawn over the table three times—once for knotting and making the reverse side, once for knotting the face side, and finally for mending. With the methods outlined below the pieces will have all mends marked by the overlooker and each piece will only require drawing over the table twice; knotting and mending taking place simultaneously. This will reduce handling time for the menders by about 3 mins. at 80 per piece.

Disadvantages of Piece Payment

The failing of a fixed payment per piece for mending pieces, with a work content varying between wide limits, is not peculiar to the operation of mending. The swing of the pay scale—from generous on good pieces to inadequate on bad ones—tends to place the operatives earnings outside her control.

System Proposed

It has been established from a considerable number of work studies that an average work value can be allocated per piece for the operations of handling, knotting and final perching, without risk of appreciable inaccuracy. It is proposed that each piece should be inspected on the perch before issue to the menders, the number and length of mends required marked on a suitable *pro forma*, and the places requiring mending indicated by chalk-mark on the piece. For the purposes of assessing work value, each separate warp-end down, or pick broken or missing, is considered one mend. Floats are indicated as a number of warp ends down for so many inches plus a number of picks for so many inches.

Work Values

The work values established are as follows:—

Handling, knotting and perching	**96 A.M.s per piece**
Mending warp end or pick (normal weave)	**0·34 + 0·225 × length in inches**
Removing trailers of 3 in. or over	**0·19 + 0·15 × length in inches**

Reference Performance

An analysis has been made of the menders' output for a certain period of four weeks. An accurate assessment of reference performance is not possible owing to absence of any information as to the number and length of mends in each piece. An approximate figure has been obtained by using the average number of warp breaks per piece from the data obtained for the weaving set up; a typical distribution by length of these mends was obtained from the studies in mending. Pick mends were added, based on average occurrence in work studies on mending.

The reference performance so obtained for this period when the mends were on piece earnings, is approximately 80 A.M.s per hour. The present departmental performance with the menders on time wage is about 69 A.M.s per hour.

Present Cost of Mending

The present cost of mending from the very approximate reference information already described is:—

	per 1,000 A.M.s
Direct labour	**371d.**
Indirect labour	**102d.**
Total	**473d.**

Proposed Method of Payment

It is suggested that menders should be paid a basic wage of 82*s.* 6*d.* per 45 hours. Bonus will be paid for minutes saved at the same rate of pay, i.e. 1*s.* 10*d.* per 60 min. saved. The minutes saved will be obtained from the sum of the work values of the pieces mended each day, less the minutes worked.

Attainable Earnings

With the basic rate of 82*s.* 6*d.* per 45 hours mentioned above the menders earnings per 45 hours will be:—

Performance	**60**	**70**	**80**	**90**
Earnings per 45 hours	**£4 2 6**	**£4 16 3**	**£5 10 0**	**£6 3 9**

Mending Overlooker

Studies have been taken of the mending overlooker and assistant weighing pieces, attaching piece ticket, rolling and stacking pieces. From these studies a work value of 12·8 A.M. per piece has been established for these operations, allowing for every fifth piece to be measured. With overlooker and assistant working together at standard rate (80) these operations would take 4 hours for 50 pieces. It is, therefore, convenient to assume that this work plus supervising duties occupy half of the overlookers day, the remaining 4½ hours being available for perching greasy pieces.

Work values for inspecting pieces on the perch before mending have not been finalised, but a check indicates that approximately 15 min. will be required per piece. With assistance provided for handling the

(*continued on page 184*)

Factors Which Influence Shuttle Flight

Equality of shed size is one amongst several vital factors in good shuttle flight. When gaiting-up a new warp the importance of good settings cannot be over-emphasised and in this respect consideration of warp shed line and race-board angles must not be ignored

By T. RAMSBOTTOM, A.T.I.

IN a previous article ("T.M.", Feb. 1960, p. 47), the eccentricity of the slay was considered under various settings and the time for shuttle passage investigated in comparison with the slay's eccentricity. This further article concerns an investigation into the size of warp shed in relation to reed displacement, when the shuttle is entering and leaving the shed, and the position of the warp shed line in relation to race-board angle. It is important, of course, for the shed to be fully opened before the shuttle can enter and size of shed depends to a great extent on the size of the shuttle in use.

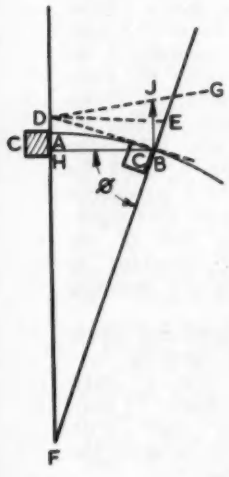
For good shuttle flight it is equally important for the bottom warp shed line angle to closely correspond with the angle made by the race-board whilst the shuttle is travelling from box to box. The race-board will, of course, be travelling in an arc, but its angle can be calculated at any time during displacement. It is intended first to find the angle made by the race-board during displacement from front to 60° after back centre, also to find the angle made by the bottom warp shed line during this period and compare the two.

Consider first the eccentricity imparted to the reed with the following settings: sweep 5 in., crankarm length 14·75 in., distance from reed to fulcrum 29·5 in. The actual measurement of reed displacement for each 30° crankshaft movement starting from front centre are set out in Table 1:—

Table 1

Crankshaft movement (in deg.)	Reed displacement (in.)
0	—
30	0·6
60	1·8
90	3·3
120	4·3
150	5·0
180	5·2
210	4·8
240	3·8
270	2·4
300	1·2
330	0·3
360	—

Fig. 1 is a diagram of the reed displacement. The reed is at beat-up position at *A* and the crank at front centre position. It is assumed the angle made by reed and race-board *C* is 90°, but this may vary with different looms. From the perpendicular position at front centre the reed and race-board will move back in an arc to a position *B* at back centre, a position varying according to the displacement given to the slay. The horizontal displacement *HB* can be measured and the angle the race-board makes with this horizontal, can be calculated. If the bottom warp shed line is to correspond with the race-board angle at 30° before back centre position, then the size of the warp shed can be calculated, also the position of the cloth fell *D*.



(left) **Fig. 1. Diagram of reed displacement**

(below) **Fig. 2. Displacement of healds if movement is harmonic**

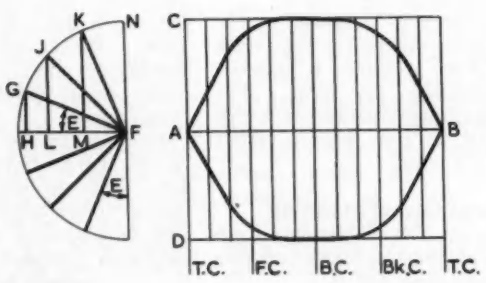
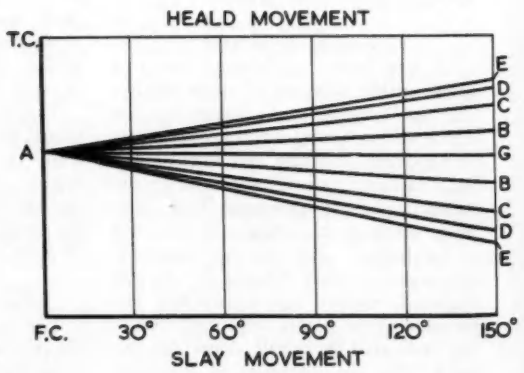


Fig. 3. Angles made by warp shed line



First consider race-board angle. Commencing with the crank at front centre position, after 30° movement the horizontal displacement of the reed (*HB*) will be 0·6 in. Angle ⌀ is calculated thus:—

0·6 ÷ 29·5 = cos angle ⌀ = 0·0203 which gives an angle of 88° 50′. Therefore, the angle made by the race-board = 90—88° 50′ = 1° 10′.

After 60° movement of the crankshaft the angle will be:—

1·8 ÷ 29·5 = cos angle ⌀ = 0·061 which gives an angle of 86° 30′. Therefore, angle made by race-board = 90°—86° 30′ = 3° 30′.

After 90° movement of the crankshaft the angle will be:—

3·3 ÷ 29·5 = cos angle ⌀ = 0·1118 which gives an angle of 83° 37′. Therefore, angle made by race-board = 90°—83° 37′ = 6° 23′.

After 120° movement of the crankshaft the angle will be:—

4·3 ÷ 29·5 = cos angle ⌀ = 0·1457 which gives an angle of 81° 38′. Therefore, angle made by race-board = 90°—81° 38′ = 8° 22′.

After 150° movement of the crankshaft the angle will be:—

5·0 ÷ 29·5 = cos angle ⌀ = 0·1694 which gives an angle of 80° 15′. Therefore, angle made by race-board = 90°—80° 15′ = 9° 45′.

After 180° movement of the crankshaft the angle will be:—

5·2 ÷ 29·5 = cos angle ⌀ = 0·1762 which gives an angle of 79° 51′. Therefore, angle made by race-board = 90°—79° 51′ = 10° 9′.

After 210° movement of the crankshaft the angle will be:—

4·8 ÷ 29·5 = cos angle ⌀ = 0·1627 which gives an angle of 80° 38′. Therefore, angle made by race-board = 90°—80° 38′ = 9° 22′.

After 240° movement of the crankshaft the angle will be:—

3·8 ÷ 29·5 = cos angle ⌀ = 0·1288 which gives an angle of 82° 36′. Therefore, angle made by race-board = 90°—82° 36′ = 7° 24′.

If we take the angle made by the race-board 30° before back centre position (approx. middle point of shuttle flight) where the healds are still fully open and the race-board almost at its maximum angle, and assume the bottom shed line corresponds to this angle, then the cloth fell *D* can be calculated, also the perpendicular depth of the warp shed from *B* to *J*.

The angle made by the bottom warp shed line and race-board will be 9° 45′ at 30° before back centre position. Therefore *DH* which corresponds to half the size of the shed can be calculated thus:—

Tan 9° 45′ × 5 = *DH* = 0·1712 × 5 = 0·856 in. and multiplied by 2 = 1·712 in. which is the perpendicular size of the shed *BJ*. The cloth fell position *D* will be: sine 80° 15′ × 29·5 = *HF* = 0·9854 × 29·5 = 29·06 in. 29·06 + 0·856 = 29·916 in. distance from *F* to *D*. Therefore, 29·916 — 29·5 = 0·416 in. The cloth fell will be this distance above the race-board when the loom is at front centre position.

Heald Movement

For purposes of calculation, heald movement can be taken as simple harmonic; size of the shed can therefore be calculated. If the healds are level at top centre position they will be fully open 120° after this, then, remaining fully open and stationary for 120°, then closing for 120° to the heald level position once again. Fig. 2 shows the displacement of the healds if the movement is harmonic and *AB* corresponds to one complete revolution of the crankshaft. This is marked off in 30° intervals and the top, front, bottom and back centres of the crank movement are indicated for comparison. If this displacement of the healds corresponds to the size of the shed calculated then, *AC* and *AD* are equal to 0·856 in. and the total size of the shed = 1·712 in.

Angles *E*, constructed to give the simple harmonic motion are 22·5° respectively and from this data the movement of the healds can be calculated:—

30° after top centre the size of the shed will be equal to *GH* × 2 and *GH* = sine 22·5° × *GF* = 0·3827 × 0·856 = 0·3276. Therefore, size of shed = 0·3276 × 2 = 0·6552 in.

60° after top centre the size of the shed will be equal to *JL* × 2 and *JL* = sine 45° × *JF* = 0·7071 × 0·856 = 0·6053. Therefore, size of shed = 0·6053 × 2 = 1·2106 in.

90° after top centre or front centre position, the size of the warp shed will be equal to *KM* × 2 and *KM* = sine 67·5° × *FK* = 0·9239 × 0·856 = 0·7908. Therefore, size of shed = 0·7908 × 2 = 1·5816 in.

120° after top centre position the size of the shed will equal *FN* × 2 and *FN* = 0·856. Therefore, size of shed = 0·856 × 2 = 1·712 in.

Warp Shed Line

These perpendicular sizes of the shed are measured at a distance of 5 in. from the front centre perpendicular zero position and represent the crankshaft position of 30° before back centre.

Reference to Fig. 3 will assist in the calculation of the angles made by the warp shed line. The horizontal distance from *A* to *G* is equal to 5 in. which represents displacement of the reed due to the slay's eccentricity. The warp shed is opening for 120° from the heald level position at top centre and the diagram shows the size of warp shed for each 30° movement of this 120°. Angle *BAB* is the size of the shed after 30° movement of the crank; angle *CAC* after 60°; angle *DAD* after 90°; angle *EAE* after 120° movement. The angle made by the bottom warp shed line can be calculated by taking half the size of the shed and the horizontal distance 5 in.

Angle made by bottom shed line after 30° movement from top centre = *BG* ÷ *AG* = tan = 0·3276 ÷ 5 = 0·0655 = 3° 45′.
Angle made by bottom shed line after 60° movement from top centre = *CG* ÷ *AG* = tan = 0·6053 ÷ 5 = 0·1210 = 6° 54′.
Angle made by bottom shed line after 90° movement from top centre = *DG* ÷ *AG* = tan = 0·7908 ÷ 5 = 0·1581 = 8° 59′.
Angle made by bottom shed line after 120° movement from top centre = *EG* ÷ *AG* = tan = 0·856 ÷ 5 = 0·171 = 9° 42′.

In comparing the angles of the bottom warp shed line and the race-board, it will be seen that the shed line angle reaches its maximum, 120° after top centre or 30° after front centre. The angle made by the race-board at this point is 1° 10′ and the displacement of the race-board to the back centre position increases this angle, from front to bottom centre at a rapid rate and from bottom to back centre at a slower rate. At this point we are concerned with the comparison of the shed line and race-board angles from the effect of shuttle flight and so in Table 2 only those angles are shown from front to 60° after back centre, showing the approach each angle makes before the shuttle enters the shed and how they compare during shuttle passage.

Table 2

Crankshaft ° Movement Starting at Front Centre	Angle Made by Race-board	Angle Made by Bottom Warp Shed Line
0	—	8° 59′
30	1° 10′	9° 42′
60	3° 30′	9° 42′
90	6° 23′	9° 42′
120	8° 22′	9° 42′
150	9° 45′	9° 42′
180	10° 9′	8° 59′
210	9° 22′	6° 54′
240	7° 24′	3° 45′

From these calculations it will be observed that the angles are in close proximity between bottom and back centre which is that part of the crank movement mostly occupied by shuttle flight. The attention of the timing of the picking and/or shedding either early or late within certain limits, will not greatly affect the shuttle flight due to the difference in the angles. However, outside these small limits the shuttle flight can be seriously affected by the difference in the shed line and race-board angles.

In order to clarify the position of warp shed line in relation to race-board, the following calculations were made. In Fig. 1, if A is taken as the perpendicular distance from F and is 29·5 in., the perpendicular distance of the race-board from a horizontal line drawn through F can be calculated. Further, the perpendicular distance of the warp shed line from the same horizontal can also be calculated and a comparison made of the two.

At front centre the race-board perpendicular distance = 29·5 in.

30° after front centre the perpendicular distance = sine 88° 50′ × 29·5 = 0·9998 × 29·5 = 29·49 in.

60° after front centre perpendicular distance = sine 86° 30′ × 29·5 = 0·9981 × 29·5 = 29·44 in.

90° after front centre perpendicular distance = sine 83° 37′ × 29·5 = 0·9938 × 29·5 = 29·32 in.

120° after front centre perpendicular distance = sine 81° 38′ × 29·5 = 0·9894 × 29·5 = 29·18 in.

150° after front centre distance = sine 80° 15′ × 29·5 = 0·9855 × 29·5 = 29·07 in.

180° after front centre distance = sine 79° 51′ × 29·5 = 0·9844 × 29·5 = 29·0 in.

210° after front centre distance = sine 80° 38′ × 29·5 = 0·9867 × 29·5 = 29·11 in.

240° after front centre distance = sine 82° 36′ × 29·5 = 0·9917 × 29·5 = 29·25 in.

Perpendicular distance of bottom shed line 30° after front centre = 5 : 0·856 :: 0·6 : x = 0·1027 in. Therefore, 29·916 — 0·1027 = 29·8133 in.

Perpendicular distance of bottom shed line 60° after front centre = 5 : 0·856 :: 1·8 : x = 0·3018 in. Therefore, 29·916 — 0·3018 = 29·6079 in.

Perpendicular distance of bottom shed line 90° after front centre = 5 : 0·856 :: 3·3 : x = 0·5649 in. Therefore, 29·916 — 0·5649 = 29·35 in.

Perpendicular distance of bottom shed line 120° after front centre = 5 : 0·856 :: 4·3 : x = 0·7361 in. Therefore, 29·916 — 0·7361 = 29·1799 in.

Perpendicular distance of bottom shed line 150° after front centre = 5 : 0·856 :: 5 : x = 0·856 in. Therefore, 29·916 — 0·856 = 29·07 in.

Perpendicular distance of bottom shed line 180° after front centre = 5 : 0·7908 :: 5·2 : x = 0·8024 in. Therefore, 29·916 — 0·8024 = 29·1136 in.

Perpendicular distance of bottom shed line 210° after front centre = 5 : 0·6053 :: 4·8 : x = 0·5811 in. Therefore, 29·916 — 0·5811 = 29·3349 in.

Perpendicular distance of bottom shed line 240° after front centre = 5 : 0·3276 :: 3·8 : x = 0·2489 in. Therefore, 29·916 — 0·2489 = 29·6671 in.

These calculations are set out in Table 3.

Table 3

Movement of Crank from Front Centre Positions (deg.)	Perpend. Distance of Race-board (in.)	Per Distance Warp Shed Line at Reed (in.)	Difference Between the Two (in.)
30	29·49	29·8133	0·3233
60	29·44	29·6019	0·1679
90	29·32	29·35	0·03
120	29·18	29·1799	0·0001
150	29·07	29·07	Level
180	29·0	29·1136	0·1136
210	29·11	29·3349	0·2249
240	29·25	29·6671	0·4171

From these calculations one can see that the bottom warp shed line, closely conforms with the race-board, at the junction of race-board and reed, from the bottom to back centre position of the crankshaft movement. After back centre position the warp shed line is beginning to rise rapidly in comparison with the race-board and, for good shuttle flight, it is necessary to have completed its passage across the slay before this takes place. Similarly, if the shuttle enters the race-board before bottom centre position, bad shuttle flight can result. Here again it shows that the alteration of the shed timing is possible within certain limits but it is also important that the timing of picking is arranged flight not to exceed these.

Picking and Shedding

Early picking and late shedding or late picking and early shedding will not give good shuttle flight. It is also obvious from these observations that the cloth fell position is important. Any alteration in height above the race-board, also alters the warp shed line angle and could seriously affect shuttle flight. Size of shed is also important, a point which must be closely watched when gaiting-up a new warp. From the calculations it will be observed that, if the bottom warp shed line and race-board angles are made to correspond when the healds are fully open and the slay is displaced by the crank at 30° before back centre then, from bottom to back centre of crank movement, the two will closely coincide to give good shuttle flight.

For further comparison the following measurements were taken on a plain loom. Crank sweep 5 in.; crank arm length 11 in., distance of reed from fulcrum 29·5 in. Crank arm horizontal at top centre position. The displacement of the slay for each 30° movement of the crank starting at front centre was as shown in Table 4.

Table 4

Crank Movement (deg.)	Horizontal Displacement of Reed (in.)
30	1·0
60	2·0
90	3·4
120	4·3
150	4·7
180	4·9
210	4·0
240	2·9
270	1·6
300	0·6
330	0·2
360	—

The heald displacement was also measured, beginning with the healds level at top centre position, and gave the results set out in Table 5.

Table 5

Crank Movement (deg.)	Heald Movement Front (in.)	Back (in.)
30	— 0·3	0·2
60	— 0·7	0·7
90	— 1·0	1·1
120	— 1·3	1·4
150	— 1·4	1·6
180	— 1·4	1·6
210	— 1·4	1·6
240	— 1·4	1·6
270	— 1·3	1·5
300	— 1·1	1·1
330	— 0·7	0·5
360	Level	Level
30	0·2	— 0·4
60	0·7	— 0·9
90	1·2	— 1·4
120	1·3	— 1·5
150	1·4	— 1·6
180	1·4	— 1·6
210	1·4	— 1·6
240	1·4	— 1·6
270	1·2	— 1·5
300	1·1	— 1·2
330	0·6	— 0·7
360	Level	Level

The measurements are taken at the healds, the front heald being 7·8 in. and the back heald 9 in. from the cloth fell. From these measurements the warp sheds can be calculated. Heald displacement is shown as a displacement curve in Fig. 4 and the top, front, bottom and back centres of the crank movement are marked to show the position of the healds in comparison with the crankshaft.

From front centre position to 60° after back centre, the angles made by the race-board are calculated:—

30° after front centre, race-board angle = 1·0 ÷ 29·5 = cos = 0·0339, which gives an angle of 88° 8′. Therefore, angle made by race-board = 90 — 88° 8′ = 1° 52′.

60° after front centre, race-board angle = 2·0 ÷ 29·5 = cos = 0·0678, which gives an angle of 86° 6′. Therefore, angle made by race-board = 90 — 86° 6′ = 3° 54′.

90° after front centre, race-board angle = 3·4 ÷ 29·5 = cos = 0·1153 which gives an angle of 83° 23′. Therefore, angle made by race-board = 90 — 83° 23′ = 6° 37′.

120° after front centre, race-board angle = 4·3 ÷ 29·5 = cos = 0·1457 which gives an angle of 81° 38′. Therefore, angle made by race-board = 90 — 81° 38′ = 8° 22′.

150° after front centre, race-board angle = 4·7 ÷ 29·5 = cos = 0·1593 which gives an angle of 80° 50′. Therefore, angle made by race-board = 90 — 80° 50′ = 9° 10′.

180° after front centre, race-board angle = 4·9 ÷ 29·5 = cos = 0·1661 which gives an angle of 80° 26′. Therefore, angle made by race-board = 90 — 80° 26′ = 9° 34′.

210° after front centre, race-board angle = 4·0 ÷ 29·5 = cos = 0·1356 which gives an angle of 82° 12′. Therefore, angle made by race-board = 90 — 82° 12′ = 7° 48′.

240° after front centre, race-board angle = 2·9 ÷ 29·5 = cos = 0·0983 which gives an angle of 84° 22′. Therefore, angle made by race-board = 90 — 84° 22′ = 5° 38′.

Considering the front healds first the angle made by the bottom warp shed line 30° after front centre will be:—

1·3 ÷ 7·8 = tan = 0·1666 giving an angle of 9° 28′.

Warp shed line 60° after front centre will be:—

1·4 ÷ 7·8 = tan = 0·1794 giving an angle of 10° 10′.

This angle will be the same for 90, 120 and 150° after front centre and at 180° after front centre the bottom warp shed angle would decrease once again to 9° 28′.

Warp shed line 210° after front centre will be:—

1·1 ÷ 7·8 = tan = 0·1410 giving an angle of 8° 2′.

Warp shed line 240° after front centre will be:—

0·7 ÷ 7·8 = tan = 0·0897 giving an angle of 5° 8′.

The angle made by the bottom warp shed line after 30° movement from front centre for the back heald stave will be:—

1·5 ÷ 9·0 = tan = 0·1666 giving an angle of 9° 28′.

Warp shed line 60° after front centre will be:—

1·6 ÷ 9·0 = tan = 0·1777 giving an angle of 10° 5′.

This angle will be the same for 90, 120 and 150° after front centre and 180° after front centre shed line angle will be 9° 28′.

Warp shed line 210° after front centre will be:—

1·2 ÷ 9·0 = tan = 0·1333 giving an angle of 7° 36′.

Warp shed line 240° after front centre will be:—

0·7 ÷ 9·0 = tan = 0·0777 giving an angle of 4° 27′.

These angles are tabulated in Table 6.

Table 6

Movement of Crank from Front Centre (deg.)	Angle Made by Race-board	Shed Line Angle Front Healds	Shed Line Angle Back Healds
0	—	7° 18′	6° 58′
30	1° 52′	9° 28′	9° 28′
60	3° 54′	10° 10′	10° 5′
90	6° 37′	10° 10′	10° 5′
120	8° 22′	10° 10′	10° 5′
150	9° 10′	10° 10′	10° 5′
180	9° 34′	9° 28′	9° 28′
210	7° 48′	8° 2′	7° 36′
240	5° 38′	5° 8′	4° 27′

From the calculations it will be seen that the warp shed line and the race-board angles closely coincide at 180° crank movement, after front centre. This angle will be used to find the position of the cloth fell. 7·8 : 1·3 :: 4·9 : x = 0·8166 in. which is half the size of the shed at reed position.

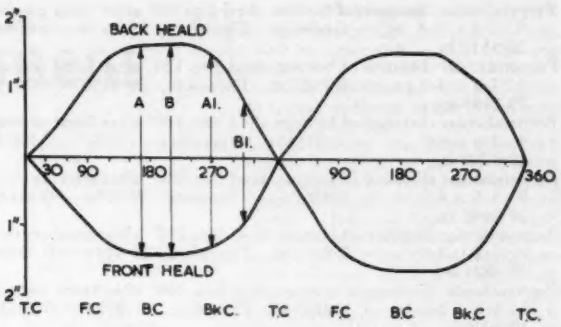


Fig. 4. Position of healds in comparison with the crankshaft

Sine 80° 32′ × 29·5 = 0·9864 × 29·5 = 29·0988 in. which is the distance from the fulcrum to the reed base and the race-board. Therefore, 29·0988 + 0·8106 = 29·9154 in.

29·9154 — 29·5 = 0·4154 in. which will be the cloth fell position above the race-board with the crank at the front centre.

A comparison of the race-board and warp shed line can also be made by the perpendicular distances.

At front centre the race-board perpendicular distance = 29·5 in.

30° after front centre perpendicular distance = sine 88° 8′ × 29·5 = 0·9995 × 29·5 = 29·4852 in.

60° after front centre perpendicular distance = sine 86° 6′ × 29·5 = 0·9977 × 29·5 = 29·4321 in.

90° after front centre perpendicular distance = sine 83° 23′ × 29·5 = 0·9934 × 29·5 = 29·3053 in.

120° after front centre perpendicular distance = sine 81° 38′ × 29·5 = 0·9894 × 29·5 = 29·1873 in.

150° after front centre perpendicular distance = sine 80° 50′ × 29·5 = 0·9872 × 29·5 = 29·1224 in.

180° after front centre perpendicular distance = sine 80° 26′ × 29·5 = 0·9861 × 29·5 = 29·0899 in.

210° after front centre perpendicular distance = sine 82° 12′ × 29·5 = 0·9907 × 29·5 = 29·2256 in.

240° after front centre perpendicular distance = sine 84° 22′ × 29·5 = 0·9952 × 29·5 = 29·3584 in.

Front Heald

Perpendicular distance of bottom shed line 30° after front centre = 7·8 : 1·3 :: 1·0 : x = 0·1666 in. Therefore, 29·9154 — 0·1666 = 29·7488 in.

Perpendicular distance of bottom shed line 60° after front centre = 7·8 : 1·4 :: 2·0 : x = 0·3589 in. Therefore, 29·9154 — 0·3589 = 29·5565 in.

Perpendicular distance of bottom shed line 90° after front centre = 7·8 : 1·4 :: 3·4 : x = 0·6102 in. Therefore, 29·9154 — 0·6102 = 29·3052 in.

Perpendicular distance of bottom shed line 120° after front centre = 7·8 : 1·4 :: 4·3 : x = 0·7718 in. Therefore, 29·9154 — 0·7718 = 29·1436 in.

Perpendicular distance of bottom shed line 150° after front centre = 7·8 : 1·4 :: 4·7 : x = 0·8436 in. Therefore, 29·9154 — 0·8436 = 29·0718 in.

Perpendicular distance of bottom shed line 180° after front centre = 7·8 : 1·3 :: 4·9 : x = 0·8166 in. Therefore, 29·9154 — 0·8166 = 29·0988 in.

Perpendicular distance of bottom shed line 210° after front centre = 7·8 : 1·1 :: 4·0 : x = 0·5641 in. Therefore, 29·915 — 0·5641 = 29·3513 in.

Perpendicular distance of bottom shed line 240° after front centre = 7·8 : 0·7 :: 2·9 : x = 0·2602 in. Therefore, 29·9154 — 0·2602 = 29·6552 in.

Back Healds

Perpendicular distance of bottom shed line 30° after front centre = 9 : 1·5 :: 1·0 : x = 0·1666 in. Therefore, 29·9154 — 0·1666 = 29·7488 in.

Perpendicular distance of bottom shed line 60° after front centre = 9 : 1·6 :: 2·0 : x = 0·3555 in. Therefore, 29·9154 — 0·3555 = 29·5599 in.

Perpendicular distance of bottom shed line 90° after front centre = 9 : 1·6 :: 3·4 : x = 0·6044 in. Therefore, 29·9154 — 0·6044 = 29·3110 in.
Perpendicular distance of bottom shed line 120° after front centre = 9 : 1·6 :: 4·3 : x = 0·7655 in. Therefore, 29·9154 — 0·7655 = 29·1499 in.
Perpendicular distance of bottom shed line 150° after front centre = 9 : 1·6 :: 4·7 : x = 0·8355 in. Therefore, 9·9154 — 0·8355 = 29·0799 in.
Perpendicular distance of bottom shed line 180° after front centre = 9 : 1·5 :: 4·9 : x = 0·8166 in. Therefore, 29·9154 — 0·8166 = 29·0988 in.
Perpendicular distance of bottom shed line 210° after front centre = 9 : 1·2 :: 4·0 : x = 0·5333 in. Therefore, 29·9154 — 0·5333 = 29·3821 in.
Perpendicular distance of bottom shed line 240° after front centre = 9 : 0·7 :: 2·9 : x = 0·2255 in. Therefore, 29·9154 — 0·2255 = 29·6899 in.

These calculations are given in Table 7.

Table 7

Movement of Crank from Front Centre Position (deg.)	Perpend. Distance of Race-board (in.)	Perpend. Distance of Warp Line Front Heald (in.)	Perpend. Distance of Warp Line Back Heald (in.)
30	29·4852	29·7488	29·7488
60	29·4321	29·5565	29·5599
90	29·3053	29·3052	29·3110
120	29·1873	29·1436	29·1499
150	29·1224	29·0718	29·0799
180	29·0899	29·0988	29·0988
210	29·2256	29·3513	29·3821
240	29·3584	29·6552	29·6899

The perpendicular distances of the race-board and warp shed lines closely correspond during the period of shuttle flight. From these calculations it will be observed that the bottom warp shed line is theoretically below that of the race-board from 90 to 150°, which means that the warp shed is bearing on the race-board during this period and could cause bad weaving.

In the heald displacement curve in Fig. 4 the shedding is normal, i.e. healds level at top centre position. *A* - *A*1 shows the shuttle flight in relation to the size of the shed, when picking early, the shuttle entering the shed at 165° and leaving at 268°. *B* - *B*1 shows the shuttle flight when picking later, the shuttle entering the shed at 210° and leaving at 313°. The former picking more closely corresponds with the shed timing, the healds being fully open before the shuttle enters and still being almost fully open as the shuttle leaves and the race-board and warp shed line angles closely correspond, thus contributing towards good shuttle flight. Excessive early or late shedding and picking, although necessary on some types of fabrics, will mean that the warp shed line and race-board angles will not correspond the same during shuttle flight and could cause trouble in weaving. Some adjustments, however, can be made by altering the size of the shed if applicable and also by altering the vertical position of the cloth fell.

The importance of having both sheds of equal size has been stressed from the point of view of equal strain on the yarn. The equality of shed size is also important for good shuttle flight. The importance of good settings when gaiting up a warp cannot be too greatly emphasised and on this account consideration of warp shed line and race-board angles must not be ignored.

The fact that the warp shed line and race-board angles closely correspond during shuttle flight appears very important. The weight of the shuttle and package will cause some sag in the warp shed line and if this is excessive, bad shuttle flight could result. If the two are closely corresponding in angles the warp shed sag will be controlled and assist towards better shuttle flight. Altering the size of the shed and varying the vertical position of the cloth fell could make the perpendicular distances correspond but this does not necessarily mean that the angles will closely correspond. It is good practice to ascertain the limitations of the loom in this respect and, for good shuttle flight, not to exceed these.

Work Study in a Mending Department

(*continued from page* 179)

pieces to and from the perch, and to look through the piece for missing picks, it is probable that this time could be reduced to 12 min. at 80 per piece. The maximum number of pieces which can be perched in 4½ hours is, therefore, 28.

Incentive for Overlooker

As the mending overlooker will be responsible for the work value given to each member for her work, it is not advisable to provide any incentive based on the mender's performance It is therefore recommended that the overlooker should receive bonus based on the number of pieces mended per head per 45 hours and the total number of pieces perched by him and mended in the week.

The bonus would be on the following scale:—

Pieces Mended per Head per 45 hours		20	25	30
Pieces per week perched and mended	25	1¾	3½	5
	50	3½	6¾	10
	100	5	10	15
	150	6¾	13½	20
	200	8½	16¾	25
	250	10	20	30

Available Results

At standard performance of 80 A.M.s per hour the cost per 1,000 A.M.s as proposed would be:—

Available Results ——→	per 1,000 A.M.s
Direct labour	367d.
Indirect labour ..	98d.
Total ..	465d.

The above figures are calculated on the basis of five menders. There is, therefore, no saving on labour costs to be obtained by application of the menders, but it is anticipated that the number of pieces mended per head per week will rise considerably. A further advantage will be found in having a daily record of the weaving faults in each piece as a control of quality of output from the weaving shed.

Money Needed for Research

Various federations in the U.K. wool textile industry may soon be asked to subscribe to an increase in the statutory levy for wool research, Mr. Basil Smith, the chairman, said at the annual meeting in Leeds of the Wool Industries Research Association. "I would ask you to support such an increase so that the work at Torridon (headquarters of the W.I.R.A.) can go on unimpeded, and so that we can take full advantage of the new scale of grants by the Department of Scientific and Industrial Research." Problems facing the wool textile industry called for more research and technical knowledge, Mr. Smith added.

* * *

South African Wool Clip

The U.K. has resumed its traditional position as the main buyer of South African wool. At the end of March—after nine months of the current wool season—it had taken 36½ million lb. of greasy and scoured wool. Second was France—main buyer for most of the season—with 35½ million lb. Other important customers were Germany (30.7 million lb.) and Italy and the U.S.A., each with 20 million lb.

Tri-Lobal Multifilament Yarn*

THE multifilament tri-lobal nylon yarn recently announced by B.N.S. is pre-eminently suitable in plain and twill weaves for printed dresses and blouses. Handle, drape and appearance resemble those of silk; lustre and scroop, which are inherently good, may be enhanced in finishing. Trials have demonstrated that the performance of garments is very satisfactory, and that machine washing is usually permissible.

This report contains suggestions for fabric and garment manufacture which may be helpful while the trade is still gaining experience of tri-lobal yarn. The two forms of the yarn are 70/34/5Z, Type 1140 (recommended for warp) and 70/34/½Z, Type 1100 (recommended for weft).

Weaving

Yarn preparation and weaving conditions are the same as for nylon yarns with filaments of circular cross-section. Especial care is necessary at a few points only.

(1) With producer-twist weft yarns, pirning tension should not exceed 0·2 grams/denier, to avoid pirn barré. Yarn drag can be minimised by the use of small-diameter matt finished guides and using as straight a yarn path as possible. Shuttle tensions should be smooth and even, and as low as possible. To reduce drawtwist barré effects, 2×2 picking is advisable.

(2) In the constructions giving the desirable drape and handle which distinguish tri-lobal fabrics there may be a tendency to thread slippage. The following should be regarded as the minimum construction which will give attractive fabrics with a high performance. (A 'pure' finish is assumed.)

PLAIN WEAVE

Ends/in.

Reed	96
Finished cloth ..	110 (approx.)

Picks/in.

Loom	76
Finished cloth ..	84 (approx.)

2/1 TWILL WEAVE

Ends/in.

Reed	96
Finished cloth ..	110 (approx.)

Picks/in.

Loom	89
Finished cloth ..	94 (approx.)

The above pick ratings in the finished cloth are achievable from the in-loom ratings by the use of overfeed during setting. Without overfeed, higher pick ratings in the loom will be necessary.

Dyeing and Finishing

The basic finishing procedure for tri-lobal yarn fabrics is similar to that used for equivalent fabrics woven from normal (circular) cross-section yarns. Fabrics may be scoured in relaxed form (on a continuous scouring range, crêping beck or winch machine) or on a jig. Normal scouring conditions, with a temperature of the order of 70°C. (158°F.) are satisfactory for most cloths when processing is at open width. Lower temperatures should be used in winch scouring, to avoid rope marking.

The fabrics may be dried and set on a multi-zone pin stenter; alternatively, relax drying may precede stenter setting. The use of overfeed during heat setting is recommended, particularly after scouring on the jig; this allows warp relaxation and develops a more pronounced warp crimp, which enhances the suppleness and drape of the fabrics.

All these tri-lobal fabrics are intended for printed dresses and blouses; they may be prepared for printing either by dyeing a ground shade or by bleaching and finishing white.

Further finishing treatments may be used to improve the handle and drape of the fabrics. Particularly, the natural lustre and scroop may be enhanced by applying a scrooping agent and it will be found that a final cold calendering treatment imparts greater smoothness and softness. Softening agents should be avoided, for they may cause seam slippage and edge fraying in the finished garments.

Making-up

Good appearance and performance can be assured by attention to the following suggestions:—

(1) Assume that the fabrics are prone to thread slippage either when new or after washing.

(2) In lay cutting use extra clips and reduce the depth of the lay if fabric slippage occurs. Avoid fabric fusing by using sharp knives and low cutting speeds. If the cut edges fray, brush or spray them with an adhesive such as one part 'Necol'[1] cement to four parts acetone. Make generous seam allowances (not less than ½ and preferable ¾ in.) when cutting out.

(3) Garment assembly by lockstitch will be satisfactory with 10 stitches per in., using a fine synthetic sewing thread[2] in a No. 11 needle. The same thread should be used in the spool. Cotton sewing threads are not suitable. Adjust thread tensions until they are as light as possible consistent with a good stitch formation. Use the lowest possible pressure on the presser foot, and a fine tooth dog set with a minimum projection above the surface of the throat plate. The needle hole in the throat plate should be as small as the needle will allow.

(4) Allow generous seams in all garment parts and avoid straight-cut raw edges, which may fray with washing. Seam fraying is best countered by heat sealing and/or overlocking the edges; but, in the absence of suitable equipment, pinked edges should be an acceptable alternative. For buttonholes, make a good bight. Use either the thread recommended for garment assembly or a good quality cotton thread. Machine made buttonholes are quite satisfactory.

References.

[1]A trade mark of I.C.I. Ltd.

[2]Suitable threads include 130/3 schappe-spun nylon and 75/3 'Taslan' textured 'Terylene'.

** A recent advance report from British Nylon Spinners Ltd.*

Trade Literature

SULPHURIC ACID AND RELATED CHEMICAL PLANT. Specialising in the design, supply and erection of plant and equipment for the chemical, petrochemical, petroleum, gas and nuclear energy industries, Power-Gas Corporation Ltd., Stockton-on-Tees, have issued a fine, two-colour brochure. This illustrates (*a*) plant for the manufacture of sulphuric acid from any sulphur-bearing material such as sulphur, pyrites, hydrogen sulphide, sinter and other SO_2 gases, spent oxide, gypsum, etc. (*b*) plants for the production of phosphoric acid from sulphuric acid and phosphate rock and triple superphosphate from phosphoric acid and phosphate rock (S.I.A.P.E. process) (*c*) typical sulphur dioxide from SO_2 gases by the pressure absorption process (*d*) plant for the concentration of sulphuric acid and (*e*) mechanical type muffle furnaces.

* * *

ETOLAN NON-IONIC SURFACTANTS. The Etolans are polyoxyethylene condensation products of wool wax alcohols, all practically 100% active material. At the moment five grades are available differing from each other in the amount of ethylene oxide condensed with the wool wax alcohol. some thickening action in high concentration; Etolan 10 is dispersible in water; Etolan 15 is soluble in water to give slightly opalescent solutions; Etolan 20 is almost totally soluble in water; Etolan 40 is totally soluble in water. Technical data sheets recently issued by Croda Ltd., Cowick Hall, Snaith, Goole, describe these wetting, dispersing and gelling agents, also the chemical and physical properties, function, manipulation, actual and possible uses, packaging handling and storage requirements.

Brand Name Change

Bury Felt Manufacturing Co. Ltd. have re-named their ranges and the name "Holmbury" will be used for all their carpet ranges. Decision to change the brand name was taken to underline the new developments in their carpet manufacture reflected in the recently launched range of tufted patterned cut pile carpets. This range, the Holmbury Three Star Quality, is proving very popular.

Need for Blending in the Production of Yarns

IN his paper to the recent Textile Institute Spinning Group Conference at Harrogate, Dr. P. P. Townend (Leeds University) said that blending was always practised in the processing of the natural fibres even when the blend consisted solely of one type of fibre such as all-wool or all-cotton. But now when the barriers between fibres had been lowered and they had extended their range of fibres to include both natural and man-made then the techniques of blending were more important than previously. Intimacy of blend might or might not be critical with a single fibre component but it always was when they mixed fibres of varying colours, physical or chemical characteristics.

"Why then, do we mix fibres?" he asked. "There are many reasons. In the first place the resultant fabric must be uniform in appearance and in properties, e.g. width across the fabric handle, height of pile, colour, etc. and this can only be attained if the yarns going to make the fabric are wholly uniform in composition and this in turn implies a certain degree of mix in the blend. If all the fibres used in a blend were alike then blending ceases to be necessary. But this ideal is certainly not possible with the natural fibres and is doubtful with the man-made ones, for in the latter there still arises the problem of uniform application of finish to the fibre and reproducibility of finishing agent, even assuming one can manufacture fibres with the same properties year in and year out."

Uniformity of fibre properties such as fineness, length, crimp, handle, strength, colour, etc. was obviously more limited with naturally occuring fibres whether they be of vegetable or animal origin (non-matriculated sheep) but he didn't think variation within a lot was so important as variation between lots with the subsequent variation between deliveries of cloth and hence lack of uniformity. One could imagine the chaos in Golden Square of the Pentagon of the alledgedly same cloth varied in colour for example, from delivery to delivery by more than tolerable limits. And so it was seen that the maintenance of standards in the finished article was a strong reason for the continuance of the blending process. And what had been said of uniformity of cloth standards was obviously true of yarns which leave spinners for the weaving and knitting industries, where again one expects a certain repeatable performance from a certain quality of yarn.

There must be a strong connection between the weight of a blend needed to fulfil an order and the available supply of any one quality of fibre and so blending becomes a necessity even if only to build up a certain weight of blend. This implies a faith on the part of the blender that the properties of his raw materials shall not vary by more than tolerable limits, but it is clearly difficult to maintain reproducible standards in raw materials which are subject to such variables as drought or disease, etc. in the case of wool. And so the yarn producer is obliged to blend sorts together since the complete absence of the part is not so serious as that of the whole, or to use a modern phrase, the blender cannot put all his eggs in one battery box. And so you will see that blending allows one to overcome possible deficiences in supply which are bound to arise when the processor has little control over the supply of his raw materials.

"Blending also allows one to utilise properties of fibres" continued Dr. Townend. "For example, it is well known that wools from different origins differ in handle, in milling power and even in spinning power, assuming the same crude properties of length, and fineness, and I think this is true of the other natural fibres, so it is argued that blending more of the one fibre and less of another enables a manufacturer to exploit these peculiar features. Thus one can modify the properties of a fabric by varying the composition of the blend. This is amply borne out in practice where, for instance, softness of handle can be improved by additions of cashmere, resistance to abrasion is improved by additions of the stronger man-made fibres, shrinkage can be reduced by additions of cotton or other fibres, the spun count can be extended in an Australian all-wool blend by the addition of non-Commonwealth, S. African wool, or in a union blend by the addition of finer denier fibres. Advantage can be taken in Spinning and/or finishing to obtain special migration effects which follow from blending long and short or thick and thin fibres together. In short it is clear that blending enables a manufacturer to exploit the particular and peculiar properties of a raw material by their judicious use."

Dr. Townend, then went on to say "So far I have spoken merely in terms of fibre properties but one must surely include in any catalogue of reasons for blending that of colour, which, in my opinion, comes very high on the list. The blending of colours is a specialised branch of the textile industry and I can only refer to it on passing but successful colour blending necessitates a more rigorous application of all the principles of blending than any other branch of the art and it may in part be due to the fact that no dyer can reproduce the same colour twice.

"Finally, one cannot dismiss the aspect of price. Blending is a technique which allows one to mix the more expensive with the less expensive fibres and so impart to the fabric a partial advantage of the dearer at a cheaper overall cost. Possibly the woollen industry is the best example of this practice for here one can blend re-manufactured and waste fibres with virgin materials to make acceptable fabrics at reasonable prices. And in this connection, too, one can quote the use of "Fibro", a comparatively cheap fibre which has found a very wide application in many fabrics chiefly because of its price.

New Indian Bearing Company

Skefko Ball Bearing Co. Ltd., Luton, announce the formation in India of a new company to be known as the Associated Bearing Co. Ltd. The new company will manufacture ball and taper roller bearings and certain other accessories. Manufacture is planned to commence towards the end of 1962 and when in full production the plant, which will be situated at Poona, will employ approximately seven hundred people. The main shareholders of the new company will be Aktiebolaget Svenska Kullagerfabriken—SKF Gothenburg, Investment Corporation of India Ltd.—a corporation within the Tata group, and Skefko Luton.

Flax and Jute Yarns

In his paper, Major J. McConnell (James Mackie and Son Ltd.) observed that inter-fibre blending fell into two distinct categories:—

(1) Fashion blends or blends of technical progress.
(2) Blends of expediency where technical knowledge is used only to produce adequate substitutes to hold down prices.

"The long staple trade" he said, "faced with the shortage of materials during the war used man-made fibres instead and from these early beginnings a completely new range of long staple machinery was developed. Where the denier was comparatively coarse and the material was required in bulk, then blends of various fibres in colour, type and denier could be blended successfully mechanically; an example in man-made fibres was bale blending to ensure a level dyeing affinity e.g. the synthetic carpet pile industry.

"Where we are dealing with fine yarn which in poundage represents a small bulk weight, then possibly we are better off by blending this by hand, this being accomplished by weighing individual constituents on to a marked card sheet. However, this is comparatively expensive as one operator can attend to only two cards. Where runs are fairly large, staple can be successfully fed to the card by an automatic feed.

"Alternatively one can use continuous tows which are cut and stapled on the card sheet. Both methods of automatic feeding allow one operator to look after up to ten cards. It must be remembered that in the long staple card we have the finest blending instrument in the world of textiles.

"To achieve the required blend the spinner must select from the various types of fibre at his disposal, and decide what their reaction will be throughout processing and finishing. In deciding the type of fibre the spinner would also decide what physical properties were required. (*a*) resiliance, strength and extensibility. (*b*) what denier and staple length were required to give properties of handling, etc. Above all was the price right and would the product sell?"

Major McConnell said that having decided on the type and details of the fibres and made the selection it was then necessary to cater for the peculiarities in each fibre and assess:—

(1) What proportion of each fibre must be fed into the machinery to produce a given proportion in the yarn or in the finished cloth.
(2) How will the individual fibres react during processing? Even though the initial cross-section of the blend may be good, it must be taken into account, for the properties contained in the denier, staple length and extensibility, during drafting individual fibres would react differently and upset the cross-section of blend.

In this connection, the co-efficient of friction—the static properties of each fibre, etc. must be assessed and if necessary lubricants or anti-static agents added.

"These factors combined, must of necessity increase the knowledge required to achieve the end purpose, but it is only by fulfilling these principles that the textile industry can successfully progress and it is up to the textile industry, and here I speak for long staple, i.e. the flax, hemp and jute trade, to realise the scope and magnitude of their capabilities made possible by the production of man-made fibres and each trade must welcome these as an ally and not an enemy.

"Consider light weight apparel fabrics. What is required? An apparel fabric should have powers of absorbancy, resistance to crushing and abrasion, e.g. In flax we have almost optimum conditions of absorbency and it can be improved to give a non-crush finish by the addition of man-made fibre. For example—take a dress cloth made from 100% flax yarn—the whole handle of the material will be improved if the mix is made 75% flax 25% man-made fibre (4½ den. "Terylene").

"If full use is to be made of the man-made fibre properties, the spinner should ensure that the man-made fibre is not stretch-broken so that during subsequent caustic shrinking of the fabric, the man-made fibre will come to the surface and will increase the anti-abrasion properties of the cloth.

"This of course, leads into another vein of technique as the properties latent in many blends containing man-made fibres can be made to produce different results in the finished cloth by using different treatments in preparing and spinning.

"On the other hand, take a fabric made from 100% man-made fibres. This can be improved in its general appearance—always a big factor in wearing apparel—by changing the mix to 67% man-made fibre and 33% flax. The addition of the one-third flax not only improved the appearance and the properties of the cloth, but during manufacture it may be of use as an anti-static agent in the mix.

"Each trade must be on the look-out for technical advance. An example of one such advance is that until now flax and wool blends were not technically possible because the flax required a very severe after treatment, but now with the successful advent of bleached flax fibre the way is possibly open for the practicable application of these blends. At any rate this is the type of thing that the progressive will always watch" concluded Major McConnell.

Congress on Cybernetics

The Third International Congress on Cybernetics, organized by the International Association for Cybernetics, will be held at Namur, September 11 - 15, 1961. The programme has been arranged in five sections:—

(1) Principles and Methods of Cybernetics.
(2) Semantic Machines.
(3) Automation: technical aspects.
(4) Automation: Economical and Social Aspects.
(5) Cybernetics and Life.

Full information will be gladly supplied by the Secretary, Association Internationale de Cybernetique, A.S.B.L., rue Basse-Marcelle, 13, at Namur, Belgium.

U.K. Uses More Wool

Rates of wool consumption, top production and worsted yarn delivery in the U.K. during February were all higher than in January. The Wool Industry Bureau of Statistics reports that the wool consumption rate was at least 5% up but possibly a little lower than a year ago, with an increase in the topmaking section and a reduction in the woollen section. February output figures were: Wool consumption, 39·9 million lb. (clean) top production, 26·9 million lb.; tops drawn, 18·2 million lb.; worsted yarns delivered, 20·2 million lb.; woven fabrics delivered, 28·4 million sq. yds.; blankets delivered, 2·7 million sq. yds.

TEXTILE MACHINERY and MILL EQUIPMENT NEWS

Three-Dimensional " Printing " of Textiles

New method of vinyl spray "prints" abstract designs on fabrics with, it is said, relatively inexpensive equipment

THE B. F. Goodrich Chemical Co., U.S.A., has recently developed a novel technique for applying patterns and textures to a wide range of fabrics by production-line methods—but without the engraving rolls or heavy fabric-printing equipment. The new process was recently demonstrated on production-scale spraying equipment donated to the School of Textile of North Carolina State College, Raleigh, by Binks Manufacturing Co., Chicago.

In the process, liquid vinyl plastic is sprayed on textiles in abstract swirls, random line or spatter designs. On heating in an oven, the vinyl fuses to the fabric in permanent patterns or textures that are said to withstand washing and dry cleaning also that the fabric's hand remains practically unaltered. This process means that three-dimensional "printing" of textiles is possible.

This novel type decorative spray technique offers considerable opportunities to designers and manufacturers. A great variety of fabrics from wovens to non-wovens to knitted materials, tight or loose construction, may be decorated by this method. Patterns and colours are practically unlimited. Fabrics prepared in this manner are now being considered for use in car interior trim, draperies and curtains, upholstery and slipcover materials, tickings, outerwear fabrics, lingerie, robes, gloves, spreads, lampshade fabrics and wall coverings.

B. F. Goodrich Chemical Co., supply the raw materials used in the process. The plastisols (vinyl plastic in the form of a liquid dispersion) used in the demonstration were prepared by Flexible Products Co., Marietta, Georgia, using Geon vinyl materials. With the Binks equipment patterns may be varied by adjusting the spray guns, altering the flow properties of the plastisol, and by changing the number of spray heads, their position or the speed of the material through the equipment. Speeds up to 25 yds./min. have been achieved, but much higher speeds can be attained if simple patterns are used and adequate oven capacity is available. Patterns may also be varied by using equipment with moving guns. Such equipment might have the guns moving on a traversing unit or mounted on an oscillating frame.

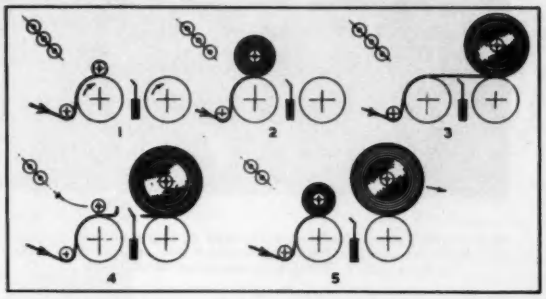
Vinyl or nitrile latex may be used in place of vinyl plastisols in the spraying operation. This is usually done when heat-sensitive fibres are being sprayed since latices can be cured at lower temperatures. When latices are used, they are simply dried and then heat cured usually at temperatures below 300°F. The advantages cited for vinyl plastisols are low cost, wide colour range, excellent aging properties and wash-fastness. Plastisols may also provide three-dimensional or raised patterns that

In this process the plastic swirls are fused on to the material in an oven. The patterns produced are claimed to be both washable and dry-cleanable

are attractive to many designers. Wear resistance is claimed to be substantially improved where three-dimensional patterns are used.

Latices also display excellent durability but are more costly and their compounding is more complex. In addition, it is difficult to achieve three-dimensional patterns when latices are used. Either hand or automatic spray guns equipped with decorator heads may be used for decorative spraying. The amount of material used varies with the design and averages 0·5 to 1 oz./sq. yd. of fabric.

New Continuous Batching Machine



Operating sequence with the continuous batching machine

IN recent years the textile industry all over the world has become more and more production conscious and to meet these circumstances, continuous ranges of all types have been built capable of productions which at one time would have been considered impossible. To allow such productions the engineer has had to design and develop new plant which is capable of handling the cloth at these increased speeds. It is realised that when such equipment is installed the time factors of the various processes become far more critical, thus stopping of a machine or range of machines must be kept to an absolute minimum.

As a result of this new line of thought Sir James Farmer Norton and Co. Ltd., Adelphi Ironworks, Salford, are producing a number of new machines. One of these is a new continuous batching machine which makes the continuous batching of cloth at the delivery end of most machines working at high speed a practical proposition. This new machine is claimed to be one of the greatest advances yet made in the automation of finishing machinery. The machine shown can be fitted with automatic control and with this equipment one man can look after the delivery end of a number of machines.

The machine will form part of the Farmer Norton exhibit at the Moscow Trade Fair, and will be part of one of several large plants being built by the company for the U.S.S.R. The operating cycle of the machine is as follows:—

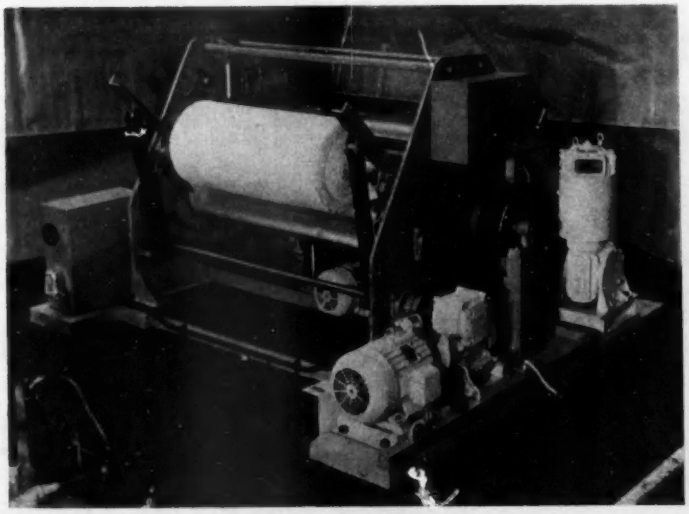
(1) Cloth is wound round the batch box, and the machine put in motion.

(2) Cloth builds up to a pre-determined diameter on the entering side drum.

(3) The cloth is automatically transferred to the delivery side drum, and allowed to continue batching until the diameter is reached.

(4) An automatic or manually controlled cutting knife located between the two drums, cuts the cloth at a pre-determined sewing, and automatically wraps the new end round a new batch box fed into the machine from a special magazine.

(5) The finished batch is then removed, and the sequence of operations starts all over again, from stage 2.



This new Farmer-Norton machine can be fitted with automatic control

LOOM PICKERS. British Standards Institution, 2 Park Street, London W.1. (price 10s., postage extra.).

More than 2,000 different sizes of pickers are at present used on looms but B.S. 3345:1961 lays down 148 sizes, considered adequate for all practical purposes. The pickers covered by the standard are for overpick, automatic underpick, and non-automatic underpick looms and may be made from rawhide, leather or plastics. Although the range is designed for use with looms weaving cotton, silk and man-made fibres, some of the pickers may be found suitable for other looms. It is hoped to publish other picker standards for the flax, jute and woollen trades.

* * *

U.K. Wool Price

Higher prices for medium and coarser wools, which form the bulk of British production, are guaranteed by the British Wool Marketing Board in its price schedule for 1961. The overall guarantee for the U.K. clip, as in 1960, is 53½d. a lb. Deductions for marketing expenses leave the producer with a guaranteed return of 48½d. a lb.

Mrs. Turid Fakset, disabled employee of Sigrun Bergs Vevstue, at work at the compressed air operated loom. In the background, an Atlas Copco PE3RGS compressor supplies the air

The five valves which actuate the loom. Mrs. T. Fakset cannot use her feet and these valves regulate the air supply from the compressor to enable her to weave carpets of high quality and intricate design

Compressed Air Helps Disabled Weaver

ANOTHER new job for disabled people has been provided with the aid of compressed air. For centuries, high quality Norwegian textiles, with their traditional geometric patterns, have been woven by skilful hands, like those of Mrs. Turid Fakset, an employee of the Oslo firm of Sigrun Bergs Vevstue. Though one of the most skilled weavers in Norway, Mrs. Fakset is disabled; she cannot use her feet. However, thanks to Mr. Trygve Kvisler, a Norwegian engineer, she can now operate her hand loom with ease—possibly more easily than many weavers who have the full use of all limbs.

Mr. Kvisler has adapted Mrs. Fakset's loom so that it can be operated by the use of hands only. He connected the moving parts of the loom to pistons operated by compressed air, the air supply being regulated by five valves conveniently placed to the right of the weaver's chair. All the healds and other parts of the loom can therefore be operated from the chair by a simple hand movement.

The compressed air is provided by an Atlas Copco PE3RGS compressor, the same type as is used by garages, cycle repair shops and other small workshops. With the aid of her modified loom, Mrs. Fakset is weaving the carpets which are to be installed in Hakons Hall in Bergen, a 13th century building destroyed during the war and now being restored.

Two-Colour Pick and Pick Automatic Changer

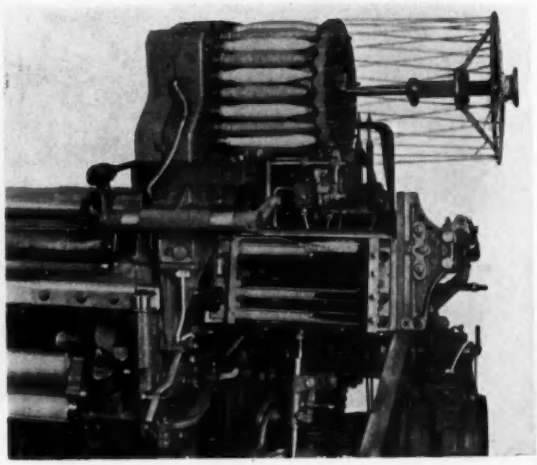
DETAILS were released recently by George Hattersley and Sons Ltd., Keighley, of a further application to their standard model loom of specialised pirn changing equipment made by George Fischer Ltd., Switzerland.

This application refers particularly to their TM2P—two colour pick and pick pirn changer which can be used either for single and two colour weft mixing with three to five shuttles, or for weaving two colour pick and pick sequences e.g. 1/1, 2/1, 3/1, 3/2, 4/1 and combinations such as 2/2—1/3, 4/2—4/4 etc.

Two shuttles are provided for each colour of weft. A third colour in one shuttle only for weaving double picks non-automatically, may be arranged. The number of cloth designs which can be woven automatically, is limited by the economic length of the reserve bunch.

Colour selection of the pirn changer is electro-mechanical and is controlled by special rollers on the box motion chain. The battery has capacity for 24 pirns of a single colour, or 12 each of two colours, (pirn dimensions, maximum: 1¼ in. (38 mm.) dia. × 10¼ in. (260 mm.) long).

The weft feeler is fitted behind the rising box at the battery end and feels the shuttle in the raised box at back centre, effecting a change if required at the following front centre position. The spent pirn is ejected from the shuttle in the top box into No. 2 (dummy) cell, where it is deflected by a "plate" into the chute. Conversion to pick-at-will 4 × 4 box is simply effected by removal of this plate and substituting sweller and spring in No. 2 cell.



Colour selection of this pirn changer is electro mechanical, controlled by special rollers on the box-motion change

AMY (Automatic Monitor Yarn) is seen here at Ewart's factory where it inspects yarn at the rate of 1,800 ft./min., grades faults into five different length groups and counts the number occuring in each group. To the operator's left is the associated sensing device, and to her right, a single-headed winder for re-winding inspected yarn

Electronic Inspection of Yarn

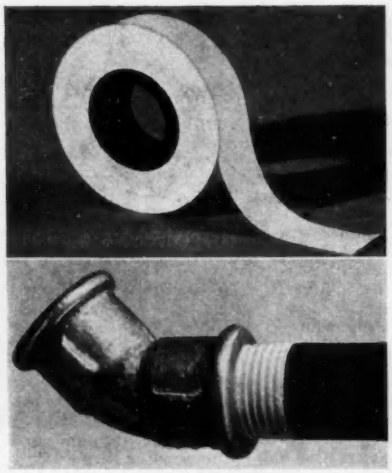
A NEW machine for analysing faults and determining the character of fibre distribution in linen yarn has been developed by the Research Department of Short Brothers and Harland's Precision Engineering Division in collaboration with William Ewart and Son Ltd., Belfast. The machine which, has been named AMY, electronically inspects yarn at the rate of 1,800 ft./min.—a speed claimed to be far greater than obtained by conventional visual methods. The important feature of the new equipment is not only the detection of yarn faults but that it measures the lengths of small fibre disturbances, grades them into five different length groups and counts the number occurring in each group.

Apart from its obvious value in controlling the quality of yarn this detailed analysis assists in maintaining spinning machinery at peak efficiency. In spinning, various faults occur which take the form of a thickening of the yarn. The degree of thickening and the lengths of the faults are important clues to their cause, and the information provided by AMY thus gives early warning of any irregularity developing in the machinery.

AMY incorporates one of the existing fault detectors as a sensing device. In this unit the yarn passes through a slot in front of a photo-electric cell. Any thickening of the yarn automatically reduces the amount of light passing through the slot, and by this means the amount and length of thickening can be measured. The machine electronically grades the faults into the length groups, 0 to ·15 in., ·15 in. to ·5 in., ·5 in. to 1·0 in., 1·0 in. to 2·0 in., 2·0 in. and over, and counts the number occurring in each group. The various totals are shown on five separate counter dials. The equipment has been in operation for several months. A high degree of correlation between the distribution of fault lengths and irregularities in the spinning machinery has already been recognised. Greater lengths of yarn can be inspected economically and the increased amount of data provided is opening up new approaches to the problem of quality control.

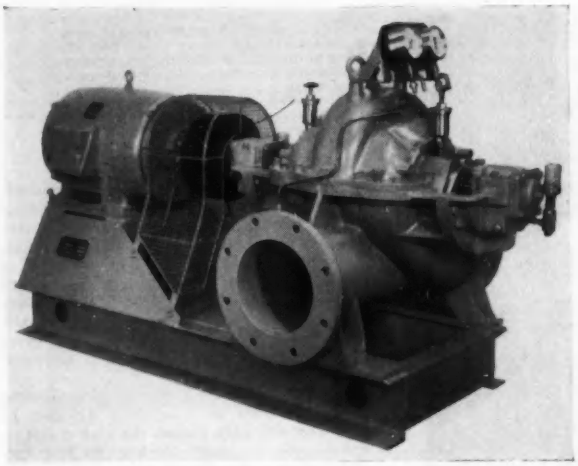
P.T.F.E. Sealant and Insulation Tape

CLAIMED to be cleaner and easier to apply than conventional sealing Compounds, "Hilflon" unsintered P.T.F.E. tape is a recent development of William Rose Ltd., Hilyn Works, Lockfield Avenue, Brimsdown. Manufactured from the inert non-toxic thermoplastic polytetrafluoroethylene, it is said to possess remarkable resistance to most known chemicals, acids, alkalis, oils, corrosive liquors and gasses. Available in a compact roll, it is economically dispensed and transported. Combined with this saving in space, handling and dispensing, there is of course no chance of wastage due to negligence and exposure to the atmosphere as the tape never hardens. "Hilflon" is manufactured from unsintered P.T.F.E. and is available in a standard size roll, ½ in. wide by approx., 520 in. length. Variations in width and thickness can be provided for sufficiently large quantities, though the standard pack has a tape thickness of ·003 in. nominal. Operational temperatures range from −450°F. to +550°F.



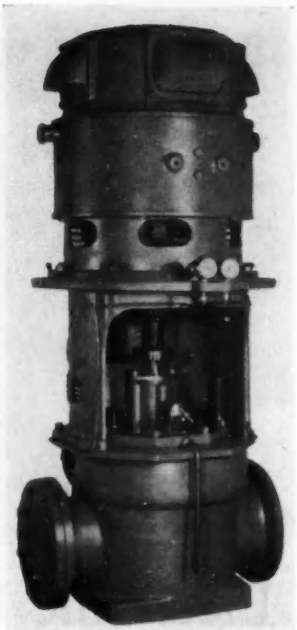
Because this tape is a compressible solid, it easily moulds itself to threaded materials and excellent anti-seizing properties enable joints to be easily broken after very long periods of time. This self-lubricating quality also means that connections can be drawn up tighter than before and very high pressures can be safely accommodated. Plastic pipe, steel, stainless steel, copper, brass, aluminium, ceramics—rigid or flexible—can all benefit by using "Hilflon" tape on their threaded sections. Imperfect threads offer no difficulty, and cumbersome flange connections can now be simplified.

CERAMIC FIBRE. An eight-page, colour brochure from the Carborundum Co., Niagara Falls, New York, U.S.A., gives details on Fiberfrax, alumina-silica fibres, a new class of high temperature insulating materials, light in weight yet physically strong. It is stated that these fibres will withstand continuous use at temperatures up to 2,300°F. Fiberfrax fibre is available in a wide variety of prefabricated forms, including bulk, chopped, washed, block, board, paper, blanket, felt, roving, wicking, yarn, rope, cloth, tape, cord, braid, castable shapes, coating cement, tubes and laminates. The brochure also gives the chemical, thermal and mechanical properties.



(left) The B10H horiqontal split casing pump

(right) One view of the Dolphin pump



Vertical and Medium Pressure Horizontal Pumps

A NEW range of Dolphin vertical centrifugal pumps, highly efficient with excellent N.P.S.H. characteristics and designed for easy installation and accessibility in confined spaces, is announced by Hamworthy Engineering Ltd., Poole, Dorset. Capacities up to 2,000 g.p.m. (9,000 litres/min.), and heads up to 300 ft. (92 metres) are achieved by interchange of impellers and diffusers within only two frame sizes. These pumps, dismantled easily and quickly by unskilled labour in a matter of minutes, are very suitable for many industrial duties. Installation is simplified by placing two diametrically opposed suction flanges to give a choice of connection and the motor support pedestal can be turned to any one of the four positions permitting maximum accessibility in restricted spaces. The short heavy section shaft runs in a single bearing which may be either grease or water lubricated and a soft packed gland or various types of mechanical seals can be fitted as required.

Another new development by the same company is a medium pressure horizontal pump designed for public water supply, power station and refinery circulation, dry docks, etc. Capacities from 800 - 8,000 i.g.p.m. (11,000 - 36,500 litres/min). and heads from 10 - 180 ft. (3 - 55 metres). An efficient, compact pumping unit, it provides maximum accessibility for removal and inspection of the rotating element. It is suitable for any method of drive and variation in glands, bearings, etc., to meet particular pumping conditions. The small Hestair compressor, also a new development, is for general compressed air duties with free air deliveries from 10 - 25 cu. ft./min. (17 - 43 cu. m./hr), and pressures up to 350 p.s.i. (24.5 kg./cm^2). Two sizes are available but apart from the cylinder barrel and piston all parts are interchangeable. A sheet metal shroud directs air on to the cylinder and head and also gives the machine a neat compact appearance. Concentric type suction and delivery spring loaded plate valves are fitted.

New Developments in Batchcounting

ELECTRONIC MACHINE CO. LTD., Mayday Road, Thornton Heath, Surrey, makers of the "B.C." range of batchcounters have re-designed their units to provide a more flexible form of basic "off-the-shelf" type of instrument. By the inclusion of the necessary stampings and fixing lugs together with a comprehensive printed circuitry it is now possible to take a "nearly" completed unit off the shelf and in a few minutes include the necessary component to meet the requirements of the stated application. Conditions under which the instrument may be installed are also taken care of by the industrial re-styling of the cabinet.

The new batch counter

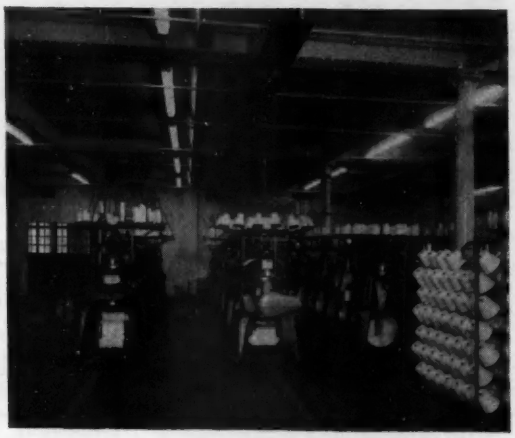
The front panel with its industrial airtight/dust-tight enclosures is finished in a metallic grey and the batch number selector switches "click" positively into their new position when rotated and at the same time a circular disc, fixed to the switch nob spindle behind the panel, shows the selected batch number through an observation hole in the panel. A toggle type re-set switch is also included as also is an internal mains adjustment panel.

The unit is made for rack, panel or case mounting to standard G.P.O. sizes. The illustration shows this unit in the new standard type individual cabinet which is finished in a polychromatic grey and has a cast black metal picture type frame which provides substantial protection to the front panel with its controls, switches and dekatrons. Design of circuitry is such that the unit can be easily modified to accommodate such applications as dual outputs, time delays, microswitch, photocell and magnetic pick-up input devices, speed of count being up to 20,000/min.

Woolcombing Time Rate

Adjustments in operatives' time rates in the wool textile industry's woolcombing section have been agreed following negotiations between the Wool (and Allied) Textile Employers' Council and the National Union of General and Municipal Workers. New rates, operating from April 1, involve increases of 4*s*. per week for men on day work and 5*s*. for night work, and 3*s*. for women.

Mill Heating Installation Controlled by Thermostats



The Raystrip equipment, manufactured by Copperad Ltd., Colnbrook, Bucks., is suspended in rows along the length of the building and provides temperatures of 55°F in the basement and 70°F at ground and first floor levels

G. N. HADEN AND SONS LTD. recently installed to their own design a medium pressure hot water heating system at the branch factory of Pasolds Ltd., Oldham, Lancs., where Ladybird children's garments are produced. The system operates at a pressure of 50 p.s.i.g. and a flow temperature of 250°F. and is served by a Nashleigh model N4 oil-fired boiler using 950 secs. Redwood No. 1 fuel oil.

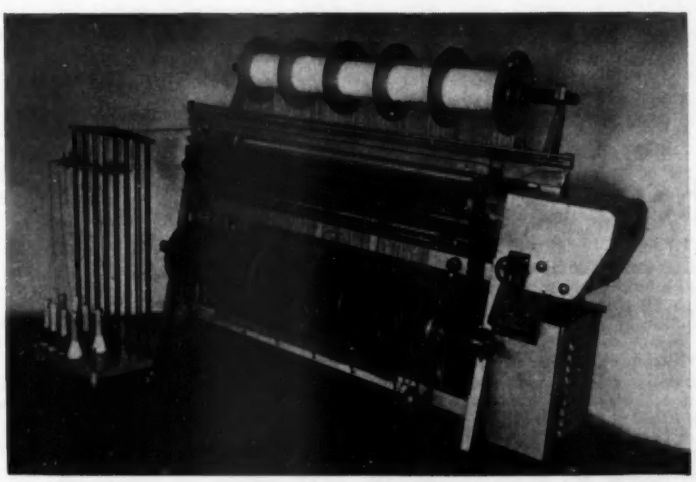
Copperad Raystrip was chosen to provide heating in the mill. It is arranged in rows suspended along the length of the building and served by five sets of thermostatic controls, each comprising an on/off motorised valve and room thermostat. One set of controls serve the basement. The ground and first floors are zoned, each having two sets of controls.

The first floor operates continuously on a 24-hour shift and the basement and ground floors operate only on 8-hour shifts. These two latter floors are therefore provided with time switches to operate the motorised valves but can be over-ridden by frost protection thermostats. Overall water temperature controls are provided by a three-way mixing valve controlled by a compensator set comprising outside pilot, immersion thermostat and control box.

The system is designed to give temperatures of 55°F. in the basement and 70°F. in ground and first floors with 1½ air changes per hour in all these areas. These figures are based on an external air temperature of 25°F. in the case of the first floor and 30°F. for the basement and ground floors. The Nashleigh oil-fired boiler is rated at 2,500,000 B.T.U. per hour and is of the treble-pass type. It has a Brockhouse model MPAM 190 burner. A type PV2 nitrogen pressurising unit is incorporated in the system, manufactured by Pressurisation Ltd. Other items of equipment include two centrifugal pumps, each capable of giving 116 galls./min. against a resistance head of 22·5 ft., one of these pumps will act as a standby, and a 3,000 gall. oil tank.

Features in New Waltex Machine

THE new Waltex machine which is reported to be tremendously popular with the Italian knitters, has several extremely interesting features. It has six gauges with warp guides every 2·8, 3·5, 5, 7, 10 or 14 mm. in each of the two bars. The approximate flat frame equivalents would be 9, 7, 5, 3½, 2½, and 1¾ needles/in. Every machine is claimed to be readily capable of working in any of the six simple gauges by changing two guide bars and a cam. Yarn guides in bars are now tubes to eliminate thread abrasion and the tubes are made of stainless steel for the three finest gauges.



Warp tension on this TWF/160 machine is automatically related to machine activity

Another important feature is the "taking-down" of the fabric between two rollers, controlled by a positive cam from the front of the machine. In fact, all movements are positive but no springs employed. Six colours or types of weft can be used at the same time and it is also possible to omit the weft at will. A weft-stop-motion is now included as well as a warp-stop-motion to each warp.

The new TWF/160 machine now has selvedge warps and warp tension is automatically related to machine activity as in the usual type of loom. Even though the weft packages are contained in a small creel at the front, the machine now occupies less space, achieved mainly by one overhead and one frontal warp. The guide bar width is now 63 in. (160 cm.) compared with the old 39 in. (100 cm.), but the speed range, depending mainly on weft strengths, has increased to 46 - 65 weft insertions per min. This means that the lower figure on the 14 mm. machine gives an output of approximately 12 yds./hour.

Geoffrey E. Macpherson (Textile Engineers) Ltd., West Bridgford, Nottingham, are making arrangements to exhibit the new machine during the next few months.

The Type 1531-A Strobotac ready for use

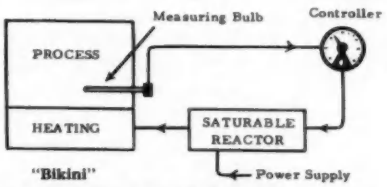
Light, Compact Stroboscope

THE instrument shown here is of considerable interest to virtually every industry for speed measurement and slow-motion or stationary observation of rotating, reciprocating and other cyclical motions in machines or processes. It is the Type 1531-A "Strobotac" made by General Radio Co., U.S.A., and available from the sole U.K. agents, Claude Lyons Ltd., Valley Works, Ware Road, Hoddesdon, Herts. Pointing out that this instrument represents an important advance in commercial stroboscope design, they state that it offers a combination of performance characteristics and design features not hitherto available.

A specially developed new Strobotron lamp produces white flashes of very high intensity and very short duration, enabling machines and processes to be observed in fine detail and natural colour under normal room and industrial lighting conditions. The flashing rate can be adjusted from 110 to 25,000 flashes/min. in three overlapping ranges and accuracy is claimed to be ± 1% of dial setting. The range selection switch and control dial are concentric for ease of operation, the range in use being clearly illuminated. Speeds of up to 250,000 r.p.m. can be measured by employing flashing rates which are submultiples of the speed to be measured.

The lamp is housed in a parabolic reflector which can be rotated through 360° horizontally and 180° vertically, thus permitting the light to be directed exactly as required. Light and compact the instrument is portable being contained in a "flip-tilt" case which provides adequate protection when closed and adjustable positioning of the control panel when open. The instrument can be placed on bench or table, held in the hand or carried round the neck.

Controls 10 kW of Heating Without Contacts



NO moving parts are used in a temperature control system employing the "Bikini" temperature controller and a saturable core reactor. Many thousands of controllers, which are completely transistorised, are reported to have gone into service on plants all over the world during the last three years and the makers' claim it is the most reliable instrument they have ever produced. This great reliability is now coupled to that of saturable core reactors to give temperature control of circuits of up to at least 10 kW with no maintenance and an almost indefinite life.

The controller and saturable core reactor operate from a robust stainless steel measuring bulb of only ¼ in. dia. and two types are available, one for use at temperatures up to 500°C. and the other for temperature up to 850°C. The controllers are available in 73 ranges covering temperature spans as short as 50°C. and as wide as 600°C. The control differential is only 0·5°C. and if desired the controller can be located as much as 300 ft. away from the measuring point. Further details are available from the manufacturers, Fielden Electronics Ltd., Wythenshawe, Manchester 22.

Lightweight Headband Magnifier

IN these days of intricate close work and the examination of minute detail any magnifying unit that can be used without personal fatigue whilst leaving both hands free, is sure to be appreciated. In this connection Ellis Optical Company, Mayday Road, Thornton Heath, Surrey. have designed a headband magnifier for use by yarn and fabric analysts, designers, engineers, instrument and tool makers, printers and engravers, Metallurgists and many others who, during the course of their working day or in their specialised studies use a magnifying device of some kind. It makes the examination of minute detail most easy.

This Ellis headband magnifier provides magnification with good stereoscopic effect, the lenses are accurately ground with the requisite prismatic effect to prevent eyestrain, even when worn continuously. The focal distance is approximately 8 in. and the field of view large, with a magnification of 2½ times.

It is constructed from a light weight plastic material and can be worn for long periods without discomfort. The hood, by extending over the top and side, shields the eyes from glare, whilst the object viewed may be under the most brilliant illumination. The lower side is open thus allowing an unrestricted downward vision, an immediate advantage to those using small tools or wishing to make notes whilst using the magnifier.

More Scoured Wool Sold in New Zealand

Slightly less greasy wool was sold in New Zealand in the first eight months of the current season than a year previously. By February 28 sales totalled 248·5 million lb., compared with 252·6 million lb. at the corresponding stage in 1960. Earnings were £42 million, a decrease of about £5½ million, with an average price of 40·7d. a lb. Scoured wool sales rose by 200,000 lb. to 2·3 million lb., but the price of 53½d. a lb. was 6½d. lower.

THE TEXTILE
COLOURIST & FINISHER

Developments in the Use and Production of Textile Auxiliaries

Some of the points discussed in this article include levelling and stripping agents, wet crease-shedding, exposure of polyester fibres to sunlight, crease-resist finishing, the action of dimethyl sulphoxide on wool, and fast-to-washing anti-static agents

By B. C. M. DORSET

FOR several years gas-fading has been a serious problem to dyers of secondary cellulose acetate fibre goods and it is particularly concerned with blue to violet shades dyed with the aid of certain aminoanthraquinone disperse dyes. This type of fading—which can be so marked as to change a blue shade to a pale reddish colour— is generally accepted as being due to the presence of oxides of nitrogen in the surrounding air and is observed when the dyed acetate materials are exposed to fumes from burning coal gas or to the damp smoke-laden air of an industrial town particularly in winter. More recently a newer but related type of fading, now generally known as O-fading, is believed to arise from the presence of active oxidising gases in the atmosphere such as ozone. While such problems have been partly solved by incorporation within the dyed material of basic organic compounds (so-called gas-fading inhibitors) the position has become more complicated by the introduction of cellulose triacetate goods which in finishing may undergo a heat treatment (not applied to secondary acetate) capable of decomposing a gas-fading or O-fading inhibitor present. It is thus useful to take note of the discovery of new inhibitors (B.P. 835,430) to combat fading under these changed circumstances.

Before dealing with new inhibitors it will be useful to outline more clearly the various problems now being encountered by reference to both secondary and cellulose triacetate fibres. Numerous gas-fading inhibitors mainly organic amines and their derivatives, e.g., diethanolamine, melamine and sym. diphenylethylene diamine, have been found useful for secondary acetate materials; they are also applicable to triacetate goods. It has been found useful to subject triacetate but not secondary acetate goods to a high temperature treatment which may reach 250°C. since in this way the safe ironing temperature and the normal fastness properties of any dyes present can be considerably increased. Such a high temperature will discolour slightly the triacetate fibres. It will also result in additional discolouration if an organic amine inhibitor is present owing to the partial decomposition of this. Such discolouration can be removed by a bleaching treatment but then comes the difficulty that heat-treated triacetate materials are liable to be hot ironed at say the high safe ironing temperatures of 200 to 220°C. (not practicable with secondary acetate materials) and under these conditions the presence of the organic amine inhibitor causes discolouration again to appear.

In recent years a number of blue to violet dyes have been discovered which are fast to gas-fading even when no inhibitor is present but then it is found that these dyes are liable to O-fading. Even the useful blue dye, 1:8-dihydroxy-4-(para-beta-hydroxyethyl-anilido)-5-nitro-anthraquinone, which has very high resistance to gas-fading so as not to need the presence of an inhibitor, is subject to O-fading. O-fading is more likely to occur with coloured triacetate materials before rather than after a high temperature treatment.

To a large extent O-fading is prevented by use of the same organic amine type inhibitors used for preventing gas-fading yet their use is not altogether desirable, for in coloured materials they tend to lower the light fastness of the colouring and their nitrogenous nature causes them to pick up chlorine when the material is washed in liquors containing sodium hypochlorite. A further objection is that these inhibitors can give the acetate fibres a moderate affinity for acid wool dyes so as to make more difficult the obtaining of cross-dyed effects on mixture fabrics containing wool and acetate fibres; the latter tend to stain by absorption of the acid wool dyes used.

Obviously the problem of inhibiting both gas-fading and O-fading is complicated but it has been made less difficult to deal with by the recent discovery (B.P. 835,430) of new O-fading inhibitors which may be used together (when desirable) with an organic amine type gas-fading inhibitor selected from those least liable to discolour at high temperatures. These new O-fading inhibitors are nitrogen-free and so

avoid causing the additional difficulties noted above, while also being stable under high temperature conditions such as may arise in hot ironing or a heat treatment to raise the safe ironing temperature of triacetate goods. It is thus now possible to overcome both O- and gas-fading difficulties arising with blue to violet aminoanthraquinone dyes on triacetate materials.

The new O-fading inhibitors are nitrogen-free ethylenically unsaturated compounds of molecular weight preferably above 1,000 and they are preferably esters (e.g., diallyl phthalate or succinate, acrylic or crotonic acid esters of mono- or poly-hydric alcohols) or are unsaturated polyesters of polyhydric alcohols and polycarboxylic acids. Examples of polyesters are the linear esters of such saturated glycols as ethylene glycol and 1:4-butenediol with such unsaturated acids as allyl succinic acid, methallyl succinic acid, and itaconic acid. It is convenient to incorporate these inhibitors directly in the cellulose triacetate before conversion into fibres (it may be added to the spinning dope consisting of a 25% solution of a 90/10 mixture of methylene chloride and methyl alcohol) since it is not easily removed from the resulting fibres by ordinary wet processes, but it may also be applied during, or after, dyeing ordinary triacetate fibre fabrics, and it can be added to printing pastes.

A satisfactory inhibitor of this type is the ester obtained from methallyl succinic anhydride and ethylene glycol and it is conveniently made by heating together for five hours at 200°C. in a nitrogen atmosphere 1·0 mole of methallyl succinic anhydride and 1·1 moles of ethylene glycol using a reflux condenser. It is generally advisable to incorporate about 1% of such an inhibitor in cellulose triacetate materials to secure adequate protection against O-fading and yet avoid discolouration in any high temperature treatment to which the dyed goods may be exposed. The following example illustrates the advantages to be obtained.

A spinning dope was prepared with 21 parts of cellulose triacetate (61·5% acetyl value) dissolved in 79 parts of a 90/10 mixture of methylene chloride and methyl alcohol and to this was added 0·63 parts of the purified polyester whose preparation is described above. The fibres obtained were spun into yarn and then woven into fabric which was then dyed with 1-methylamino-4-hydroxyethyl aminoanthraquinone and thereafter the fabric was heat-set at 230°C. for 7 secs. in a radiant heat oven. When this fabric and similar dyed fabric (except that no inhibitor was present) were exposed to an O-fading test for 100 hours the former retained the high rating of 4 on the International Gray Scale while the latter fabric faded so as to retain a rating of only 2 to 3.

No discolouration of the dyed fabric containing the inhibitor occurred during the heat-setting treatment and during a subsequent heating for 15 min. at 200°C. The presence of the inhibitor left the triacetate fibres non-receptive to acid wool dyes so that they could be satisfactorily used for the preparation of wool-triacetate mixture materials required for dyeing cross-dyeing. When the dyed fabrics (one free from the inhibitor) were subjected to an O-fading test before the heat setting treatment it was found that after 18 and 100 hours the inhibitor-containing fabric retained its original rating of 5 and then of 3 to 4 respectively while the other fabric (containing no inhibitor) faded so as to retain ratings of only 3 to 4 and 1 to 2 respectively. If it is required to use a gas-fading inhibitor with the O-fading inhibitors described above then it is recommended to use one which is least discoloured under high temperature conditions. The polymethyl vinylpyridine gas-fading inhibitors described in B.P. 792,237 have this desirable resistance to heat.

Levelling and Stripping Agents

According to B.P. 852,548 the dyeing levelly of most types of fibres including cotton, wool, and nylon with various types of dyes including direct cotton, vat, pre-metallised, and wool milling dyes can be assisted by having present in the dyebath one or more agents made by the polyethoxylation (using ethylene oxide or polyethylene glycols, etc.) of diamines of the formula given in Fig. 1,

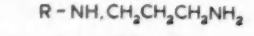


Fig. 1

in which R is an aliphatic hydrocarbon having 8 to 22 carbon atoms. Thereafter the product may be optionally treated with an alkylating or aralkylating agent such as dimethyl sulphate or benzyl chloride to quaternize the nitrogen atoms. The resulting agents are water-soluble and in aqueous solution ionise to form cations conforming to the formula in Fig. 2,

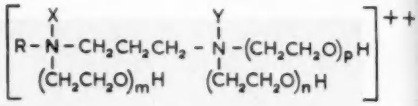


Fig. 2

in which m, n, and p may each be 0 to 200, but it is generally preferable for $m + n + p$ to be 25 to 35 or 150 to 200. X and Y are hydrogen atoms or alkyl or aralkyl groups. Suitable diamines to be used as raw materials for these agents are 1 : 3-propylenediamine derivatives such as technical mixtures of N-aminopropyl-R-amines in which the R group corresponds to the mixture of alkyl groups present in coconut, soya bean, and tallow fatty acids.

A typical dye levelling and stripping product is made causing 440 parts of ethylene oxide to add on to 400 parts of the commercially available technical propylene-diamine of the formula in Fig. 3, wherin R-NH- is a "tallow

Fig. 3

amine" radical. It is a brownish oil having good water-solubility. Similar products can be made, also water-soluble, by causing up to 8,800 parts of ethylene oxide to add on to 400 parts of the propylene diamine and, as in the former instance, this add-on is assisted by the use of caustic soda as a catalyst with the reaction temperature maintained at 150 to 170°C. The product described can be converted into their quaternary ammonium form by adding to either of them (1/10th gram/mol.) dropwise with 15 min. at 50 to 60°C. 13·9 grams of dimethyl sulphate and then heating at 80°C. for 30 min.

For the levelling of nylon unevenly dyed with Xylene Fast Orange R it is advised to treat the dyed material for 60 min. in a boiling bath containing (calc. on the nylon) 10% Glaubers salt, 4% glacial acetic acid, and 2% of one or other of the products described above.

For stripping cotton fabric dyed with the vat dye Sandothrene Orange R the fabric should be worked in a long liquor maintained at 30 to 50°C. which contains per 1,000 parts 4 parts of sodium hydrosulphite, 25 parts of 30% aqueous caustic soda, and 0·9 parts of one of the products above described (e.g. that made from 1,320 parts of ethylene oxide and 400 parts of the technical propylene diamine containing a "tallow amine" radical) and thereafter quaternized by

treatment with dimethyl sulphate. Complete stripping of the dye follows initial conversion into its leuco compound. These compounds can be very useful for preventing skittery dyeings when dyeing wool.

Deep Dyeing "Orlon" with Disperse Dyes

According to B.P. 853,217, if a polyacrylonitrile fibre such as "Orlon 42" is dyed with disperse dyes in the presence of a cationic dispersing agent, the fibres are induced to absorb more dye than usual so that deep dyeings can be obtained. It is a proviso that the disperse dye should not contain an anionic dispersing agent since the two types of dispersing agents are not compatible with each other and mutally precipitate. In this connection it is necessary to remember that almost all disperse dyes contain in their commercially available form anionic dispersing agents. However, it is found that cationic dispersing agents are compatible with those having a non-ionic nature and so these latter, if present in the dye or dyebath, do not hinder the deep dyeing desired.

In general it is better for the cationic dispersing agent to be mixed with the dye before use and the disperse dyes which respond most readily to the use of such agents include those poorly soluble or insoluble in water and which are commonly used for dyeing cellulose acetate, polyamide, and polyester fibres. Not only polyacrylonitrile fibres but also included are those made from copolymers of acrylonitrile and other components such as vinyl acetate, vinyl pyridine, and ethyl methacrylate and vinylidene cyanide. These fibres thus include Orlon, Acrilan, Creslan, Pan, Darlan and Dralon.

The cationic dispersing agents which have proved very suitable include the Sapamines (Ciba) and alkylpyridinium chlorides (I.C.I.) such as lauryl- and cetyl-pyridinium chlorides. Those agents containing a quaternary ammonium group described in B.P. 738,306 are also suitable. Claim is made that by use of these cationic dispersing agents in dyeing and printing techniques it is possible to obtain up to a four-fold increase of the depth of the shade which would be obtained without their use. In an alternative method of using this discovery the polyacrylonitrile material may be pretreated with the cationic dispersing agent and then be dyed with the disperse dyes provided these are free from anionic dispersing agents although they may contain agents of the non-ionic type. In the preferred method of dyeing with disperse dyes these should first be mixed or ground with an equal weight of the cationic dispersing agent say N-para-stearoylaminophenyl-N, N, N-trimethylammonium methosulphate and also to the dyebath liquor should be added an additional 1 g. per litre of the same dispersing agent.

Wet Crease-Shedding

In producing cotton and viscose rayon fabrics having crease-resistant properties, it is important for such fabrics to have the power to shed, on wetting, any creases they may have acquired in the dry state. While fabrics made crease-resistant in the usual way by application of a thermosetting resin often have both resistance to creasing in their dry state and also the power to shed on wetting any creases formed in the dry state, it is not always so; they may lack this latter property.

This desirable wet, crease shedding power can be given to cotton and rayon fabrics by treating them, under as little tension as possible, with a dilute solution of caustic soda which swells the fibres without damaging them. Now an alternative method for achieving the same object (B.P. 852,962) involves a treatment with ethylene diamine. An important point and one which makes it radically different from a previously advised swelling treatment with caustic soda solution, is that the fabric must be stretched while the ethylene diamine is being washed out and during subsequent drying. This stage of the treatment is most conveniently carried out on a stenter. The following indicates the essential features of such a treatment.

A spun viscose rayon fabric was treated in open width under as little tension as possible with ethylene diamine for 2 to 3 min. at room temperature. The fabric was then stretched on a stenter frame to approximately 140% of its wet relaxed area and washed with hot water at 70 to 80°C. until free from ethylene diamine. It was further dried on the frame whilst held stretched to the same area. The resulting fabric was then found to be wet crease-shedding and also resistant to creasing in the wet state. When such processing was modified so that there was no stretching of the fabric this was ultimately left with little or no wet crease-shedding properties. The wet, crease-shedding fabric prepared as described above can then be made resistant also to dry creasing by treating with a urea- or melamine-formaldehyde resin in the usual manner.

"Terylene" Materials

Polyester fibres, such as those made of polyethylene terephthalate, are liable to photochemical decomposition when exposed to sunlight or to any other light source containing ultraviolet light. For instance, polyester fibres directly exposed to sunlight for about 500 to 600 hours can lose 60% of their original strength. This liability to lose strength in sunlight would be very serious in the case of say "Terylene" curtains if it were not for the fact that ordinary window glass cuts off much of the light spectrum which is responsible for such degradation. But for outdoor purposes it is important that some protective agents should be available for incorporating in the polyester fibres. Alternatively, a dope containing such protective agents should be available for coating the polyester fabric or other material and it has already been proposed that various dihydroxybenzophenones can be used in this manner since they are capable of absorbing light within the wave-length range of 290 to 3,700 milli-microns. Such compounds conform to the general formula, Fig. 4, wherein *R*

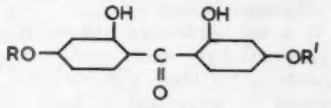


Fig. 4

represents either hydrogen or an alkyl group of up to C^5 while R^1 represents an alkyl group of the same value as R. These 2, 2^1-dihydroxy-4, 4^1-dialkoxybenzophenone or 2, 2^1, 4-trihydroxy-4^1-alkoxybenzophenone compounds have been earlier described in B.P. 706,151 and 766,863. It is now an important point (B.P. 852,977) that these same compounds can be added to a dyebath for say "Terylene" materials containing any of the commercially available dyes for this type of synthetic fibre (usually a disperse dye) and dyeing carried out under the usual conditions. The result is that both dye and the benzophenone compound become absorbed simultaneously and equally fast to subsequent washing while the presence in the fibre of the benzophenone compound ensures protection of both fibre and dye against change during exposure to sunlight. This double benefit is obtained irrespective of whether or not the dye is normally fast to light. This discovery enables

fast dyeings to be produced on polyester materials using dyes which may or may not be fast to light ordinarily, provided the dye has an affinity for the fibre.

In a typical instance, polyethylene terephthalate fabric was dyed with the blue disperse dye 1-amino-4-anilinoanthraquinone at the boil for one hour in a dyebath containing also the dye dispersing agent consisting of a condensation product of formaldehyde with an alkylnaphthalene sulphonic acid and 0·5% (calc. on the polyester fabric) of 2, 2¹-dihydroxy-4, 4¹-dimethoxybenzophenone having the formula, Fig. 5. After rinsing, soaping

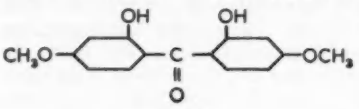


Fig. 5

and drying, the dyed fabric was exposed to light within a Fadeometer for 55 hours together with a similarly dyed fabric except that no protective benzophenone compound was used. At the end of the period the latter fabric had faded badly whereas the specially dyed fabric was unchanged. Similar protection of dyed polyester fabric was obtained using 2, 2¹, 4-trihydroxy-4¹-methoxybenzophenone and 2, 2¹-dihydroxy-4, 4¹-dipropoxybenzophenone.

It is also significant that when the above dyeings were well washed repeatedly the same high standard of fastness to light was retained thus indicating that the protective compound present was fast to washing and not adversely affected by it. Further trials have shown that similar improvement of fastness to light can be obtained in the same way using the benzophenone compounds when the polyester fabric contains up to 90% of wool.

Crease-Resist Finishing

While crease-resist finishing is being largely carried out with the aid of formaldehyde condensation products with urea or melamine and with reactants such as ethyleneurea-formaldehyde a recent American discovery (U.S.P. 2,904,388) shows that it can be very satisfactory to use instead formaldehyde condensation products of certain dihydrazides conforming to the general formula, $R(CONHNH^2)^2$ in which R represents a saturated carbon chain of 2 to 6 carbon atoms which is interrupted by one or two oxygen or sulphur atoms in the form of ether or thioether linkages as for example, diglycolic acid having the formula (Fig. 6), or thiodiglycolic acid.

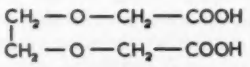


Fig. 6

The condensation products of this type are preferably prepared by reacting 6 to 15 moles of formaldehyde with one mole of the dihydrazide under slightly acid to alkaline conditions of pH 6 to 11 but preferably 7·5 to 9·5 at room temperature or up to about 50°C. In applying them to cellulose fibre goods it is desirable to have a catalyst present which may be magnesium chloride, aluminium chloride, aluminium formate and an ammonium or organic amine salt such as methylamine hydrochloride. The treated fabric is then dried and further cured for up to 10 min. at 300 to 400°F. the period being inversly proportional to the temperature. Although the dihydrazide contains nitrogen, the finished fabric having good-crease-resistance is substantially non-chlorine retentive and not liable to damage when, in laundering or other cleaning and whitening treatments, it is exposed to treatment with a hypochlorite bleach liquor and subsequently hot ironed. The following results, obtained in some trials comparing the new finishing process with one which uses ethyleneurea-formaldehyde, show some of the advantages to be obtained by using formaldehyde-dihydrazide condensation products.

The formaldehyde-dihydrazide condensation product was made by slowly mixing 1·42 moles of formaldehyde in the form of a 37% aqueous solution with 0·237 mole of diglycolic acid dihydrazide having the formula (Fig. 7) and 405 c.c. of water at room

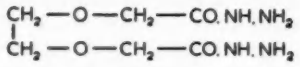


Fig. 7

temperature and at the same time adding slowly sufficient of a 10% solution of caustic soda to maintain the pH at 9·5. The mixture was then allowed to stand at room temperature for 30 mins. It must be noted that during standing, changes occur in the glycolic acid dihydrazide which make the finishing treatment more effective; such changes can be followed by the solution becoming more acid.

To the above prepared solution an addition of 3·2 g. of magnesium chloride hexahydrate was made and this changed the pH to 8·4. The solution was divided into four equal parts and two of these were diluted with equal parts of water thus giving two solutions each containing 10% of the reaction product and two solutions each containing 10%. They were then padded on to cotton fabrics mercerised and non-mercerised, dried and cured and afterwards the fabrics were tested for crease-resistance and strength to obtain the results set out in Table 1.

Such data as those given clearly show it is possible to obtain with the new formaldehyde-dihydrazide condensation products a useful degree of crease-resistance without harming the cellulose fabric to a degree more than is generally acceptable. But by further testing it was found that the crease-resist fabrics so obtained as described above were largely immune to damage following treatment with hypochlorite liquors whereas the fabric finished in the usual way with the ethyleneurea-formaldehyde compound suffered badly. The following comparison shows this clearly.

Cotton fabrics (not mercerised) crease-resist finished with a 5% solution of the diglycolic acid dihydrazide-formaldehyde condensation product and with ethyleneurea-formaldehyde were similarly steeped in a dilute solution of sodium hypochlorite such as would be commercially employed to effect whitening in laundering; they were then rinsed and dried. The fabrics were then subjected to a standard scorching test by placing them between two electrically heated metal plates suitably hinged and weighted so that standard conditions of pressure and temperature were employed. Loss of strength was measured for each fabric; the losses found were 4% (of original) and 75%

Table 1

Fabric Treated	Solution Conc. Applied	% Add-on of Dry Solids	Crease Angle	% Loss of Strength
Mercerised cotton	None	None	69	—
" "	5%	5·0	119	16
" "	5%	5·6	117	14
Non-mercerised	None	None	76	—
" "	10%	10·4	127	32
" "	10%	11·4	135	20
" "*	10%	10·0	120	40

*** This refers to a comparative fabric made crease-resistant by treatment with a 10% solution of an ethyleneurea-formaldehyde compound.**

for the finishes obtained with the dihydrazide and ethyleneurea compounds respectively. Actually, it is generally admitted that crease-resist finishes obtained with nitrogen-containing resin products lead to a 50 to 90% loss of strength in such a test for the reason that the finished fabric greedily absorbs and retains active chlorine from the hypochlorite liquor and that under conditions of moist, high temperature pressing this results in the formation of hydrochloric acid. The drying into a cellulose fibre fabric of even very dilute mineral acid solutions is well known to produce excessive tendering.

It has been established that the new method of crease-resist finishing gives satisfactory results on linen fabrics when the curing is effected at 325°F. for 3 mins. and then followed by mercerisation with caustic soda of 60 Tw. with opportunity to shrink freely in both weft and warp.

Dimethyl Sulphoxide and Wool

In the production of dense wool fabrics it is customary to rely to some degree on a treatment which generally involves working the fabric in a warm soap liquor which causes the wool fibres to close up on each other. In this felting process the wool fibres retain their original length. But in recent years, especially with the introduction of synthetic fibres which under high temperature conditions can be induced to contract in length and so allow dense fabrics to be made by fibre contraction, it has been recognised that some use might be made of another property of wool—the ability of the fibres to contract considerably in length as the result of steaming or treatment with special reagents. It is conceivable that by taking advantage of the supercontractive forces latent in wool fibres it might be possible to process open wool fabrics to convert them into dense fabrics merely as the result of fibre contraction—effects could thus be obtained not previously possible or more conventionally than by denser weaving or knitting.

Recently Koenig and O'Connell (J. Text. Res., 1960, **30**, 712) drew attention to the action of dimethyl sulphoxide on wool and described how it is possible to use this oily product, having a boiling point of 189°C. and freely soluble in water, to effect the super-contraction of wool fibres and thus find a use in wool finishing processes. Fortunately this organic liquid is non-toxic, colourless, and without odour and has excellent solvent properties for many different substances capable of reacting with wool. It decomposes only slightly at the boil but since it becomes reactive towards wool at temperatures around 100°C. this decomposition need not hinder its application. Dimethyl sulphoxide has the formula shown in Fig. 8.

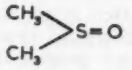


Fig. 8

Since preliminary experiments indicated that the most satisfactory temperature for treating wool with dimethyl sulphoxide from the viewpoint of causing a high degree of shrinkage without incurring too high a degradation of the wool a trial was made in which wool fabric was heated with the new re-agent for various periods up to two hours at 150°C. thus allowing the data in Table 2 to be obtained.

Table 2

Change of Properties of Wool	Control Fabric	Dimethyl Sulphoxide Treated Wool		
Time of treatment, hours	2·0	0·5	1·0	2·0
Area shrinkage, %	0	19	28	36
Fabric density, mg./cm.	23·3	31·6	32·6	35·7
Wet breaking strength	191	136	100	82
Dry " "	227	215	183	151
Wet Elongation, %	48	50	63	69
Dry "	22	25	23	19
Tear strength	3·11	2·55	1·95	1·50
Flexual rigidity	127	169	253	609
Crease resistance, crease angle	149	146	138	131

It was found that after a treatment for two hours the epithelial scales remained intact and the cortex not separated while the fibres had an increased cross sectional area of 10% X-ray examination and a measurement of the birefringence of the treated fibres indicated that the dimethyl sulphoxide is able to penetrate the oriented parts of the fibre and there reduce both orientation and crystallinity. The treatment also causes no change in the nitrogen and sulphur contents of the wool fibres but it increases moderately the solubility of the wool in alkalis and acids. Koenig and O'Connell consider this new reagent for wool is well worth further study with a view to using it to produce length changes in wool fibres which might be useful for the closing up of yarns and fabrics thus producing commercially useful effects.

Fast-to-Washing Anti-Static Agents

A disadvantage of some anti-static agents, now available for application to nylon, "Terylene", Dynel and other hydrophobic synthetic fibres, is that they are water-soluble and easily removed from the material they have been applied to by simple washing treatments. It is thus useful to note the appearance of a new type of anti-static agent as disclosed (B.P. 854,381) by the Onyx oil and Chemical Co., U.S.A. which essentially consists of a mixture of two water-soluble components capable of combining with each other within textile material as the result of a short high temperature treatment to form an insoluble compound fast to washing and dry cleaning. The compound thus left in hydrophobic fibre goods can have the effect of lowering their electrical resistivity such that any static initially formed rapidly dissipates to any earthed conductor with which they come in contact during handling. The formation of such an insoluble compound virtually has the effect of making the textile material a reasonably good conductor of electricity.

Of the two components one is a water-soluble linear basic polyamide prepared from a dicarboxylic acid and a polyamine containing two primary amino groups and at least one secondary or tertiary amino group and such a polyamide consists of long molecules containing the recurring structural units shown in Fig. 9, in which R is a hydrogen

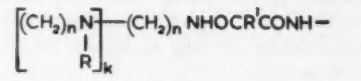


Fig. 9

or an alkyl or aralkyl group, R^1 is a covalent bond or a substituted or unsubstituted aliphatic, aromatic or alkyl-aromatic radical, K is an integer of 1 to 4, and n is an integer of 2 to 8.

The second component is a diester alkylating agent capable of cross-linking and insolubilising the above described polyamide when heated together with it. When the above two components combine the water-insoluble anti-static product formed is a polyamido polyquaternary ammonium compound whose molecules contain the recurring units shown below in Fig. 10, in which R, R^1, K, and n

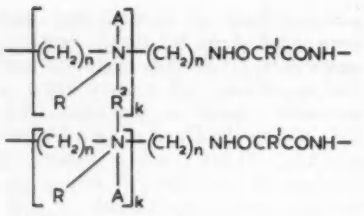


Fig. 10

have the same meanings as given above while R^2 is a substituted or unsubstituted aliphatic or alky-aromatic radical, and A is an anion.

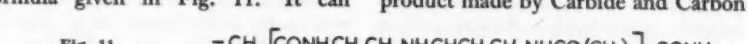
The presence of about 1% of such a complex compound in a hydrophobic fibre is able to lower the electrical resistivity of 10^{15} ohms to 10^9 ohms and this value is retained throughout several washing treatments so that the fibres can retain their anti-static properties throughout a long useful life. It has been found from general experience that if a textile fibre has a resistivity of not more than 10^9 ohms it will seldom give trouble as regards any tendency it may have to accumulate static.

Among the suitable water-soluble polyamides for making these anti-static agents are those which result from condensation of such dibasic acids as adipic acid (and dimethyl adipate), succinic acid and its anhydride, diglycolic acid, sebacic acid, oxalic acid and terephthalic acid with such polyamines as N-methyl-N-bis-(3-aminopropyl)-amine, diethylene triamine and triethylene tetramine.

The alkylating agents found suitable for combining with these polyamides to give them the required water-solubility are benzyl chloride, ethyl bromide and polyethylene glycol halohydrins of average molecular weight 400 to 3,000.

The diester alkylating agents for use as the second component in the formation in the textile material of the insoluble anti-static agent include xylylene dichloride, glycerol dichlorohydrin, dimethyl zylylene dichloride, and polyethylene glycol dihalides of average molecular weight 400 to 3,000. The preparation of a typical anti-static agent of this type is, firstly, the polyamide is made by condensing at up to 200°C. while removing the liberated water of reaction equi-molecular proportions of adipic acid with diethylene triamine. It is a yellowish water-soluble solid of low softening temperature and has the formula given in Fig. 11. It can

Fig. 11



be readily alkylated by esters of suitable acids to form soluble (if monoesters are used) or insoluble (if diesters are used) alkylated polyamido amines but since in this case the polyamide itself is water-soluble this is not necessary to enable it to be used for the treatment of textile material.

A solution consisting of 88 parts of water, 10 parts of the above described polyamide and 1·9 parts of the cross-linking and insolubilising compound having the formula set out in Fig. 12.,

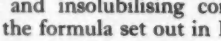


Fig. 12

and being the di-iodide of polyethylene glycol 600 (a commercially available product made by Carbide and Carbon Chemical Corp.) is prepared and used for impregnating Dacron (polyethylene terephthalate) fabric. This is then dried and cured for 10 mins. at 120°C. and the increase of weight indicates that 2·9% of the cross-linked insoluble anti-static agent has been left in the fabric. This fabric has a low electrical resistivity such that it has no objectionable tendency to accumulate electrostatic charges and it retains this property after repeated washing. It is useful to note that fabrics finished with these basic anti-static agents aquire the property of being readily dyed in deep shades with acid wool dyes.

Society of Dyers and Colourists

The Standfast Process

AN apparent misconception concerning the Standfast molten metal process assumed that, because the process originated in the Standfast Works and was quickly adopted in many other British dyeworks where relatively short runs were a necessary feature of the commission work undertaken, the process was unsuitable for dealing with long runs, observed Mr. A. Ogden (director, Standfast Dyers and Printers Ltd.) in a recent address to the Manchester Junior Branch of the Society of Dyers and Colourists.

It was true, he continued, that its facility for dyeing the whole of a short run correct to shade was a great advantage to the commission dyer who was exposed to claims against the quality of his work, but the process had been equally successful when used by vertically organised companies which handled long runs to a shade and, was of particular value where the end use was the making-up into garments, where uniformity of colour was important. The process attained a high degree of efficiency because of the short down time for changing colours and the fact that there was no stoppage of the bulk production range for determination of recipes or adjustments to the dye or chemical baths. It was because of the stability achieved in the chemical bath that tailing of shade was avoided, he said.

Mr. Ogden went on to say that the following advantages were claimed for the process:—

(1) Excellent predetermination of dye recipes, which permitted efficient operation of the bulk machine without stoppages for dye mixing or adjustments to the dye and chemical liquors.
(2) The choice of vat dyestuff combinations was unlimited in the leuco system. Hot-dyeing and cold-dyeing dyestuffs might be used together.
(3) Uniformity of shade was maintained throughout short or long runs with drastic reduction of seconds and elimination of shade selection.
(4) There were savings in consumption of chemicals, steam and water.
(5) Time lost in changing from shade to shade was reduced to a minimum.

Discussing the addition of a padding mangle to the unit to obtain a better penetration, Mr. Ogden said this was located in advance of the metal machine. Advantage was taken of the physical properties of the molten metal in giving an average squeeze of 140% as against the normal expression of a pad mangle of approximately 70%.

In contemporary systems, dispersed vat dye was applied in a padding mangle and reducing chemicals in another similar padding mangle. In each case the squeeze must be considerable and the degree of expression very similar in each mangle in order to achieve uniform liquor content. Under these conditions, it was essential for the cloth to be dried after padding with dispersed vat pigment dye liquors in order to ensure adequate and even impregnation of the chemical liquors, for reliable results. Such a step was not necessary in the molten metal range, as the cloth may receive a 70% dye liquor content at the padding mangle, and be fed immediately in the wet condition through the bath on the molten metal machine, which would now contain reducing chemicals heated from cold by the same means as those for the leuco dye liquor of system No. 1. At this point a further 70% or so of reducing chemicals would be absorbed which, in the passage of the cloth through the molten metal, would achieve reduction of the pigment dye within the cloth, and it would emerge from the machine in the fully dyed condition.

Preparation and Bleaching of Cotton Fibre

By PROF. K. S. CAMPBELL*

BLEACHED cotton in the bone-dry state is almost pure cellulose, but to bring raw cotton to this state of purity, a great deal of physical and chemical cleaning must be done. When received at the mill, cotton has been only partially cleaned mechanically at the gin. Even after the considerable additional mechanical cleaning that the fibre receives during the first stages of yarn manufacture, it still has clinging to it a certain amount of seed-coat fragments, seeds, and sometimes fragments of the cotton plant.

Motes should therefore be included among the impurities that must receive attention in subtractive finishing operations necessary in preparing cotton textiles for the consumer. In addition to motes, the impurities listed in Table I must be removed; these impurities account for 4% to 6% of the total composition of mature cotton.

Table 1

Constituent	Dry Weight		
	Typical %	Low %	High %
Cellulose	94·0	88·0	96·0
Protein (N × 6·25) ..	1·3	1·1	1·9
Pectic substances ..	0·9	0·7	1·2
Ash	1·2	0·7	1·6
Wax	0·6	0·4	1·0
Malix, citric, other organic acids ..	0·8	0·5	1·0
Total sugars	0·3	—	—
Pigments	Trace	—	—
Other	0·9	—	—

What Cotton Impurities Are

The protein in cotton is customarily estimated from nitrogen found in the fibre, although it is possible that some of the nitrogen present is non-protein in source. The protein is located largely in the lumen of the fibre and is readily removed by scouring as indicated by the fact that no appreciably further change in nitrogen content occurs once a mild alkali boil has been given the fibre. It has been claimed that the brown colour in cottons and in kier liquors (from the alkaline boiling of cotton under pressure) is due to proteinaceous matter, but there appears to be very little evidence of this.

Pectins and Ash

Pectic substances or pectins are present principally on the outside of the fibre primary wall and exist as insoluble calcium, magnesium, and iron salts. These salts are resistant to removal by water but respond readily to treatment with hot alkaline liquors. The ash content of cotton, which varies in amount and nature depending upon locality or growth and fibre variety, contains a number of constituents. Predominant among them are oxides of potassium, calcium, magnesium, sodium, silicon, phosphorus, iron, and aluminium.

When cotton is washed in water, about 85% of the ash is removed and the amount of ash remaining after ordinary scouring and bleaching is usually less than 0·25%. In fact, this latter figure is sometimes taken as one of the criteria of satisfactory bleaching. Presumably the ash is more or less uniformly distributed throughout the fibre.

* *Dept. of Textile Chemistry, N.C. State College School of Textiles*

Wax

Cotton wax is the material that can be extracted from raw cotton by organic solvents such as chloroform and carbon tetrachloride. It is not unlike carnauba wax in some of its properties; but it is actually a mixture of many higher alcohols and fatty acids, plus glycerol resinous material, and several other substances. The wax is found chiefly in association with the primary wall of the fibre and contributes substantially to its properties. It has a lubricating effect that accounts for the superior spinnability of natural cotton compared to de-waxed fibre such as raw-stock-bleached or dyed cotton. On the other hand, cotton containing its natural wax is difficult to wet out and nearly impossible to bleach, print, dye, or finish uniformly.

Although the scouring that normally precedes bleaching is primarily for the removal of wax, scouring and bleaching together remove only 50 to 60% of the wax originally present. The residual wax content, one of the best indicators of the efficiency of commercial scouring and bleaching, is usually considered satisfactory if it is approximately 0·3%. Scouring evidently removes the wax from the fibre surfaces; after scouring the cotton is easily wetted by water.

Pigment

The colour of raw cotton is due to a pigment of unknown composition. Present in only trace quantities, it must be removed almost completely to provide satisfactorily bleached cotton. Well-scoured but unbleached cotton may have a per cent. reflectance as compared to magnesium oxide (measured on a Hunter Reflectometer with a blue filter) of 70 to 75, whereas fully bleached cotton generally has a per cent. reflectance of 85 to 90 under similar conditions of measurement. The colouring matter itself is not extractable but must be destroyed by oxidizing substances such as sodium hypochlorite or hydrogen peroxide. However, the bleaching step may also decolorize or solubilize coloured substances other than pigment; that is, it may also serve to complete the action begun in the scouring step.

It is known that as cotton fibres increase in fineness the percentages of wax, pectin, and nitrogenous material they contain also increases. Furthermore, thin-walled immature fibres reveal an abnormally high pectin, sugar, and nitrogen content. When raw cotton is extracted with water (hot or cold), some 84% of the ash, all of the potassium and sodium salts, and the sugars are removed; but the wax, protein, and pectin are relatively uneffected. Dilute boiling sodium hydroxide removes a little more of the ash, all of the pectin, about 90% of the protein, and 60% of the wax. If additional removal of impurities is required, special treatments with organic solvents or acids may be used. The practical alternative is to bleach the cotton.

Fibre Construction

A cotton fibre grows from the outer wall of the cotton seed along with as many as 10,000 others on the same seed. The fibre is a thin-walled tubular structure until it reaches its full length, which is several thousand times its diameter. During the growth period of from two to three weeks, the fibre walls, which are about 1/250,000 in. (0·1 micron) in thickness, are held round and full by the pressure of the protoplasmic fluid within coming from the plant. This primary wall becomes the outer wall of the fibre because growth next takes place by building up lavers from within. The primary wall is composed of about 54% cellulose; the remainder is wax, pectin, and some nitrogenous and other substances. This thin outer covering also includes the cuticle, which is its outermost covering.

Cuticle and Primary Wall

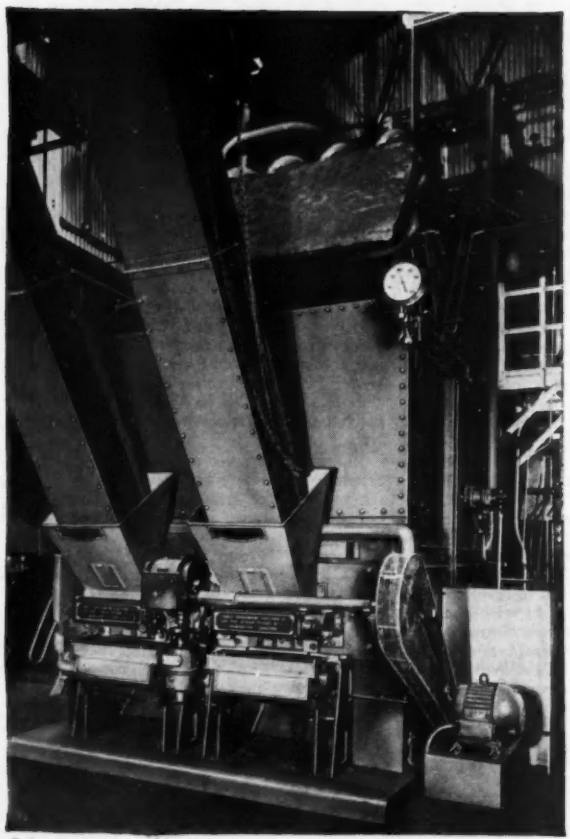
This combination cuticle-primary wall is extremely important to the textile chemist. Although it accounts for only about 3% of the total fibre bulk, it is involved in wetting, dyeing, and finishing phenomena because all reagents must pass through it to get to the main body of the fibre. Furthermore, the cuticle and/or primary wall resists the action of cellulose solvents to a greater extent than does the secondary layer. As one evidence of this, restricting ligatures of disrupted outer wall appear at intervals along a fibre swollen under certain conditions and produce the appearance of a string of small balloons.

Secondary Wall

The secondary wall is produced layer by layer from within the fibre over a period of 25 to 40 days and comprises the great part of the bulk of the fibre. It is relatively pure cellulose and is about four microns thick. The first of the layers is known as the winding. It is of about the same thickness as the primary wall and in relative location and thickness bears somewhat the same relation to the secondary wall as the cuticle bears to the primary wall. The winding, perhaps for physical reasons, appears to be less reactive chemically than the main part of the secondary wall.

Photomicrographs and electron micrographs of various parts of the cotton fibre show clearly a spiral structure that certainly contributes greatly to physical properties and indirectly to chemical properties. These spiraling units are threads of cellulose molecules usually called fibrils and will be discussed further in this series of articles. At the end of the growth period, the cotton fibre dries out because it is no longer getting juices from the plant. The originally round tube collapses to a more or less flat, wrinkled, twisted (convoluted), ribbon-like structure. The lumen is now quite restricted in area and contains some residual debris from dead protoplasm.

COAL–properly used– is the cheapest fuel for the Textile industry



Coking stokers feed coal continuously, quietly and invisibly into this modern boiler.

The very range and complexity of the Textile Industry makes it extremely sensitive to the fluctuations in the industrial barometer as the fickle demands of fashion make one fabric popular at the expense of another. Thus, no part of this great industry can afford to ignore any possible economy, any possible improvement that will keep prices competitive while satisfying—and expanding—markets both at home and overseas.

BEGIN AT THE BEGINNING– THE BOILERHOUSE

There are still some textile firms that handicap their finances with outdated boilerhouses. To modernise other machinery while 'making-do' with inefficient boilers is to throw good money down the drain. Coal-burning installations, mechanically stoked, can be so efficient that they will more than pay for themselves in a remarkably short time. They are, without question, the first essential in a factory that is going to make rising profits for its management.

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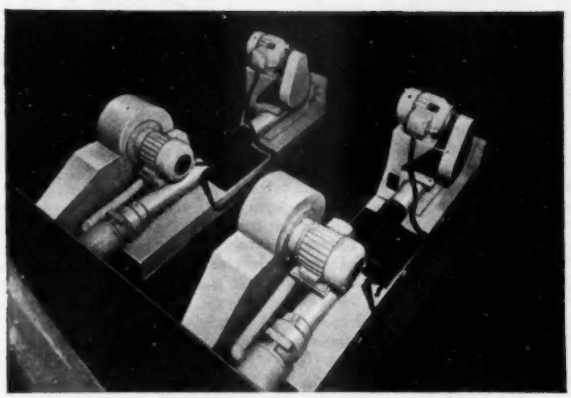
COAL IS CLEANER, HOTTER

Modern grading and washing methods ensure that coal is the most efficient and consistent fuel for every type of boiler—the ideal fuel for every section of the textile industry. But to obtain the maximum heat at the lowest cost, coal should be mechanically stoked. A mechanical stoker automatically feeds the right amount of coal for the boiler load even when the load is varying; it burns coal at optimum efficiency all the time without the emission of smoke (thus complying with the regulations in Smoke Control Areas) and it virtually replaces the human element in boiler operation.

There are many types of mechanical stokers, of which the most commonly used are the Chain grate stoker, the Coking stoker, the Underfeed stoker and the Sprinkler stoker. Standard models are available for all sizes of boiler.



Two underfeed stokers which will feed coal direct from a storage hopper into a modern vertical boiler.

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SOLID FUEL—more heat at less cost—and it's British

PROGRESSIVE INDUSTRY IS GOING FORWARD ON COAL

ISSUED BY THE NATIONAL COAL BOARD

How to Forestall Crocking

By M. MACKAY

CROCKING of printed or dyed goods can be reduced considerably if certain precautions are taken. Goods should be thoroughly free of sizing and other foreign matter before being dyed or printed. Size left in absorbs colour itself and retards its penetration into the fibre. Poorly bleached goods also resist absorption of colour and can be expected to crock to a greater extent than well-bottomed fabrics.

In printing, deep engraving has been found helpful in reducing the tendency of some colours to crock. Deep engravings transfer more colour to the goods, and the colour intensity can be less than is needed to achieve the same effect with a shallow engraving. Shallow engravings tend to give surface prints susceptible to crocking because they lack penetration into the fibre. The effect is most noticeable on heavy fabrics like corduroys or flannels.

Assistants May Reduce Crocking

Some preparations that aid penetration have been found helpful in reducing crocking. In cases where poor preparation, residual size, or both are inducing crocking, a good wetting-out agent often helps to overcome the trouble, but an excess amount can affect the washfastness of the print or dyeing.

A plain or crush roller mounted on the printing machine will often cut down the tendency of a colour to crock. The position of the roller printing a colour liable to crock is also important. For instance, if the crock-sensitive colour is printed No. 1 in a 4-colour pattern, the colour will be less apt to give trouble than if printed last and without a following crush roll.

Wet or dry crush rollers may be used to reduce crocking. The dry roller, which must be the same size as the rollers in the pattern, is a driven roller and redeposits colour picked up from the cloth. Colour yield is increased but with a wet crush roller about 10% of colour is lost. The dry roller must be watched carefully because lint or threads will adhere to it and cause squeeze-outs or light spots in the printed figures.

Vat Dyes Crock Little

Vat colours show the greatest crock resistance, due principally to the method by which these colours are fixed. Vat dyes are applied in a mix that contains the finely ground pigment plus a reducing agent, an alkali, and a hygroscopic material.

At the time of application, the vat dye is still in the insoluble form but is reduced during the ageing process to the leuco form. In the leuco state, the colour enters and becomes a part of the fibre and the oxidising process then converts the dye back to its insoluble form while locked within the fibre. Vat colours may crock if insufficiently fixed, overdried when printed, or left too long before ageing. Improper ageing may also cause vat colours to crock.

Azoic Colours

Printed naphthol colours usually have excellent crock resistance. The naphthol base is generally applied on a pad and is well penetrated into the fibre. If the coupling procedure that takes place on the printing machine is retarded by lowering the pH of the naphthol-salt mix, prints with good crock resistance are obtained.

Rapidogen-type colours are more likely to give crocking trouble than the regular naphthols previously described. Rapidogen-type colours are a one-package product that contains the naphthol, the base, and a stabiliser. These colours are applied from strongly alkaline pastes that solubilise the colour. The colour must be kept soluble until the print is aged to insure good yield and fastness.

The Rapidogen-type colours are aged in an acid atmosphere at 200 to 230°F. The alkali in the paste is neutralised by tne acid vapour, and the naphthol and base couple "in situ" to produce the desired shade. Slow ageing with weak acid produces the best results, because the components couple more slowly and the fibre is better penetrated than when a more-acid condition exists in the ager. Some Rapidogen-type colours can be aged very fast but are generally more expensive than slower ageing combinations.

As with other types of dye, some naphthols are better in respect to crocking than others; new colour combinations should be checked in the laboratory before being put into production.

Resin Help Pigments

Water-in-oil emulsions are used extensively to carry pigments for printing. Pigment prints have excellent all-around fastness but tend to crock in deep shades. However, for most purposes, crocking is satisfactorily controlled by incorporating a latex or an acrylic resin in the printing emulsion. The latex or resin forms a continuous film around each pigment particle and reduces the tendency to crock.

Oil-in-water printing emulsions are becoming increasingly important as carriers of pigments for printing. In this system, crocking is generally less of a problem than with water-in-oil emulsions. Lattices and resins are also used in oil-in-water emulsions to cut down crocking. The oil-in-water system prints more on the surface and prints sharper, and colours are cleaner and brighter than those produced by the older method. Up to now, however, the water-in-oil system is in greater use.

To Improve Crocking

Assuming a print will not pass a reasonable crocking test, it is sometimes possible to aftertreat it so that it will be entirely acceptable in respect to crocking. Such goods may be padded in a latex or resin solution that forms a film over the colour and keeps it from transferring to another surface. A better way is to overprint the goods with a blotch roller furnished with a latex or resin emulsion. In this way, sufficient protection can be given the colour without ruining the hand of the fabric, which is not often possible when the padding method is used. While such corrective methods are often useful it is better to avoid crocking trouble at the point of application rather than by some after-treatment that may have undesirable side effects.

New Reddish Blue Dyestuff

THE principal merits of this latest addition to I.C.I. Dyestuffs Division's range of reactive dyes, Procion Blue H5RS builds up to heavy reddish navy shades. Wide use for the new dye is envisaged in textile printing, particularly for cotton and viscose rayon dress goods and, in full shades, for furnishing fabrics. It can be applied to cellulosic fabrics and to chlorinated wool and natural silk by the recipe normally recommended for "H"-type Procions, although on cellulosic materials higher tinctorial yields are obtained if the normal sodium bicarbonate is replaced by double the amount of sodium carbonate. The high solubility is a further advantage in printing, stock pastes containing 1 lb. of dye per gallon being prepared without difficulty. In dyeing, Procion Blue, H5RS, apart from its value in self-shades, is particularly recommended for use in admixture with Procion Brilliant Blue H5G to give a wide range of bright blues on cellulosic textiles. It can be applied to cotton by the batchwise, pad-batch and continuous techniques recommended for "H"-type Procions, and to viscose rayon by the pad (alkali, urea)-dry-bake process, yielding strong reddish blue shades with a high degree of fixation. It can also be applied to viscose by hot batchwise deying.

* * *

NEW BOOKLET ON INTERLININGS.—A new publication (Booklet S.1) explaining how Solena bonded fabric interlinings are used in ladies' wear is available, free, from Bonded Fibre Fabric Ltd., Henrietta House, Henrietta Place, London, W.1. Solena is made by bonding carefully blended fibre mixture with synthetic resins and rubbers in the company's modern Bridgewater factory. After introductory remarks on the nature and advantages of Solena and general hints to the maker-up on handling the material, information is given on its use in dresses, separates, suits, costumes, raincoats, overcoats, children's wear and millinery. The 12-page booklet is fully illustrated by means of explanatory diagrams and photographs.

S.D.C.'& T.I.

Dyeing Furnishing, etc. Fabrics

AN important aspect of trading was emphasised in a meeting to the Society of Dyers and Colourists, London Section, and the Textile Institute, London Section, by Mr. Roy Hawthorn, (director, Henry W. Gibbs Ltd., piece goods dyers and finishers). Mr. Hawthorn observed:— "Down the years we have very often heard the words 'end use' and 'fitness for purpose'. Very often these words are flung in the face of the dyer and finisher, together with a letter and a bill for the lot, when cloth which he has processed fails to reach a given standard of performance. I would like to emphasise that it is the practice of my company at least to ask always what is the end use of the cloth which we are asked to dye. Once we know this we are always prepared and in fact always do give our customer the benefit of our experience so that the cloth can be dyed with what we consider the correct dyestuffs to yield the best result obtainable. This sometimes is not, after experience, what we have been told by the makers!"

"If, therefore, for any reason at all the customer does not take our advice, then it shows very clearly that any blame which the ultimate user levies against the cloth's colour performance must be placed fairly and squarely upon the shoulders of the merchant converter, or whoever has given us the processing order in the first place."

Mr. Hawthorn, who was speaking on the dyeing of furnishing fabrics, said that for normal vat dyes they always used dyestuffs derived from anthraquinone, and always selected those which had first, a very high light fastness and secondly, those which gave a solid shade on viscose and cotton.

Regarding soluble vat dyestuffs, these were used on types of cloth where penetration was required, and where it was uneconomic to put the cloth through a pad mangle.

In furnishing ranges which had bright, full shades, they chose azoics which gave the required light fastness and those which were known to give the best results to dry rubbing.

In connection with the reactive group, Mr. Hawthorn said:— "Here we must say that we have been disappointed with their use in our section of the industry. We have found that the reds are not fast enough to light and that the blues are not fast to gas fume fading. Only the yellows are really suitable for our class of work, and they are excellent.

Occasionally they were asked for black dyeings and here they used the fifth group of dyestuffs, a good sulphur black. The sixth group consisted of the directs and if they had to use something better than ordinary D.F.L. then they very often used after-treated D.F.L.'s of the copper complex variety.

Lastly, they came to the disperse acetate colours. The ones they used were the Eastman dyestuffs purchased from the U.S.A. because they had the required fastness to light, and also a complete absence of gas fume fading.

A serious problem was weavers' oil marks and grease. A conflict was going on all the time as to who should deal with these weavers' oil marks and grease. If they had to hand treat all cloth coming into their works then he estimated production would go down by 75%. "Unless the industry does pull itself together over this point then I can see that our export markets are bound to suffer in comparison with our Continental freinds," said Mr. Gibbs.

The problem of the ever-present cotton seeds (a problem which the dyer of furnishing fabrics met a lot because of the enormous amount of condensor yarn used in the weft of furnishing fabrics) and the never-ending problem of the commission dyer of reconciling his finished yardage with the original grey yardage,' were discussed.

Discussing acetate and cotton mixtures, this group of furnishing fabrics had had a big effect on the soft-furnishing industry. By cross dyeing these fabrics they had been able to produce what in effect looked like a colour woven cloth but was at a piece dyed price. This was where Eastman colours came into the picture, because they had enabled the acetate to be dyed with a light fastness of 6 or more which was absolutely right for furnishing fabrics and they had also overcome the trouble of gas fume fading. Very few of the ordinary disperse colours had the necessary high light fastness which furnishing fabrics requires and he felt they would all agree that inhibitors were not really the answer to the problem particularly on furnishing fabrics. There were blues other than Eastman Blue which were fast to gas fume fading, but Mr. Hawthorn claimed that these other dyestuffs stained the cotton to such an extent that staining could not be removed.

When using Eastman dyestuffs they dyed acetate at the boil. This, in their experience, was the only way to dye Eastman dyestuffs satisfactorily but it had to be remembered that although the cloth in passing through the jig beck was subject to a high temperature, that temperature must fall as it ran on the batch.

Some difficulties which the dyer experienced were mentioned. How could he be expected to differentiate between two different manufacturers of acetate yarn? That was something which emerged only when the cloth was dyed and the damage had been done. Another difficulty was in the differing loom-state width. This could be a headache no matter what the cloth was, no matter what dyestuffs were being used, and it very often occurred when the converter had the cloth made by two different mills. Lastly, there was the difficulty which sometimes arose when the shedding operation went wrong on the loom, with the result that there was a variation in the design repeat. This once again was difficult to detect. So often the dyer was told that he had stretched the cloth when in fact it had been the fault of the loom in the first place.

Society of Dyers and Colourists

Continuous Dyeing of Synthetic Fibres and Blends

CONTINUOUS dyeing methods normally included the following steps (*a*) padding, with or without subsequent drying (*b*) fixing of the dye in the fibre and (*c*) after treatments—rinsing, soaping, etc., said Dr. J. Khachoyan (Compagnie Francaise des Matieres Colorantes, Paris) in a recent address to the Scottish Section of the Society of Dyers and Colourists. For best results, a 3 or 4 bowl mangle was recommended with 2 or 3 impregnations and 2 or 3 nips. If the goods were to be dried after padding the heat obviously must be uniform on both sides of the fabric to avoid migration and two-sided effects.

For the second step, the dye fixation or, in other words, the dyeing proper, different possibilities existed.

(1) The Thermosol process.
(2) The modified Thermosol process for polyamides.
(3) The pad-steam process.

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Fixation by Selected Infra-Red Rays

This process resulted from research work done by P. Rochas which showed that each synthetic fibre had a specific maximum absorption of infra red rays of definite wave length. It seemed that such absorption conferred to the fibre an activation energy which excited and vibrated the macro-molecules and consequently allowed the fixation of the dye in the fibre.

A continuous dyeing apparatus based on this principle had been constructed by the Temtex company. It consisted of a pad mangle and a reverse U-tube in which the Infra red elements producing rays of definite wave length were sited on both sides of the fabric. In the ascending side of the tunnel the fabric was dried after padding, and in the descending side the dye was fixed in the fibre. After-treatment was carried out normally. This process was said to be suitable for the dyeing of both polyamide and polyester fabrics.

High Pressure Steaming

In this new process the dye was fixed in the fibre by a continuous steaming of the padded and dried fabric under pressure at high temperature (120 - 130°C.). A suitable steamer had been made by Konrad Peter of Switzerland. In this the pressure was obtained by obstructing the entry and the exit of the steamer with horizontal bowl mangles. This high temperature steaming method was suitable for both polyamide and polyester fabrics.

The Thermosol process for polyester fabrics had developed enormously during the past year or two for polyester/cellulosic blends, for example 65/35 or 75/25 "Terylene"/cotton or viscose. The temperature necessary for good fixation of the disperse dye in the polyester fibre presupposed a good sublimation fastness of the dye in question. The range of new disperse colours recently introduced by Francolour—the Esterophiles, each brand of which had outstanding sublimation fastness—was particularly suitable for this work.

On polyamide fabrics the Thermosol process was also successful. It reduced considerably the incidence of warp stripiness. Dyes of high sublimation fastness must be used, and Dr. Khachoyan suggested in particular selected 1:2 disperse metal complex dyes—Amichrome Light Yellow 2RL, Red RBL, Grey 5BLL and Black RBLL— and the new range of special acid dyes, the Dimacides. With the Amichromes they obtained first, the minimisation of streaks and barry dyeing and second, high saturation values allowing the realisation of dark shades. The Amichromes were recommended mainly for these dark shades, having excellent light and wet fastness.

The Dimacides were a new range of special acid dyes shortly to be marketed by Francolor, and developed for the dyeing of polyamides. These dyes possess an interesting property and an important advantage over the classical acid dyes used for nylon. This was their similarity to disperse dyes, and it seemed that their dyeing mechanism was similar to the Amichromes. In other words, there was first a chemical reaction between the sulfonic groups of the dye and the amino groups of the fibre, and secondly dissolution of the dye into the fibre in the same way as disperse acetate dyes. This explained the results obtained with the Dimacides (*a*) minimisation of streakiness and barriness (*b*) High saturation values leading to very full shades and (*c*) No "blocking" phenomena, and the different dyes could be mixed together. The Dimacides were very bright and had good light fastness. The range included a yellow, orange, scarlet, red and two blues. Because of the limited solubility of the orange and red elements they were to be used for pale shades only.

Society of Dyers and Colourists

Movement of Dye Molecules Within the Fibre

THE rate at which a textile material took up a dye from a dyebath was very important to the practical dyer and was also of interest from a theoretical point of view, observed Dr. R. McGregor (lecturer in Textile Chemistry, University of Manchester) in a recent talk to the Manchester Section of the Society of Dyers and Colourists. The object of most of the research work on dyeing had he thought, been to find some fundamental way of describing the dyeing process, so that the behaviour of dyes on different fibres and when applied in admixture, could be predicted in advance.

It could not be said that this ideal had been reached, he said, but several developments of practical use had come from dyeing research. The difficulty of working with a heterogenous system was that in dyeing there were at least three distinct steps to consider (*a*) transport of dye to fibre surface through dyebath (*b*) penetration of dye through fibre/water interface and (*c*) diffusion of dye into and through fibre. In theory and practice, any one of these three processes might control the rate of dyeing and the problem was obviously a complex one.

The simplest description of the process came from measured rate-of dyeing curves, but this approach made no assumptions about the mechanism of dyeing and was simply a description of the end result. Most of the advances had been made by suggesting that stage (*c*) the diffusion of dye through the fibre, was the rate-controlling process and that consequently the rate-of-dyeing curve could be predicted from the laws of diffusion. This would not be so in every system but this assumption of diffusion-control was implicit in what he had to say subsequently.

After discussing the essential features of diffusion, Dr. McGregor observed that one would expect that where dyeing was diffusion controlled, there would be some correlation between diffusion co-efficients and times of half-dyeing, measured under controlled conditions since both defined in some way, the rate-of-dyeing curve. There was the added complexity of a finite dyebath to consider, but it had been shown that from measured values of half-time infinite dyebaths one could calculate values for the diffusion coefficient. This involved certain assumptions which suggested that whilst this approach gave good results with disperse dyes on acetate rayon and with direct cotton dyes applied with a fixed proportion of salt to cellulose, it might be less successful with other systems. Nevertheless it represented an important practical advance, particularly in dyeing from small finite baths.

Although there was no doubt about the usefulness of diffusion coefficients and times of half-dyeing from the rate-of-dyeing curves, there was one big snag, and that was that they were insensitive to behaviour in the fibre which was of importance in theory and often in practice. The only real solution was to "get inside the fibre as it were" to see what was happening. The essence of the problem was to find out how the dye was distributed in the fibre during dyeing, i.e., to measure diffusion profiles since these were extremely sensitive to departures of the system from ideal behaviour and useful information could be obtained from them.

After outlining Neale's multiple membrane experiments, Dr. McGregor went on to refer to a new technique first used to study diffusion of photographic dyes in gelatine emulsions. Their object was to find out the distribution of dye inside a polymer film after short times of dyeing and this required a delicate micro-technique.

The actual experimental work was then described by the speaker and also the apparatus. Results showed that there were differences of great significance between the dyeing systems studied. This new technique could reveal extremely interesting facts about the dyeing system—facts which could not be obtained in any other way.

Foam-Backed Materials

ARTHUR Tate and Co. 26-28 Great Portland Street, London, W.1, have made arrangements with Reeves Bros. Inc. for the sole marketing and distribution in the U.K. of Reeves' Curon laminated fabrics. Curon is a multi-cellular polyester-based polyurethane foam material. A sixteenth of an inch backing of Curon weighs only 1¼ oz./sq. yd. yet is so soft and pliable that a full square yard can be squeezed to the size of a tennis ball. When released, it immediately resumes its original shape.

The first fabrics in the Tate range to be laminated with Curon will be a range of cottons to be marketed under the trade name "Coolino with Curon." Initially the range will be imported from the U.S. and will include poplins, Bedford cords, gaberdines, corduroys and sateens, suitable for men's and women's outerwear.

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Bleaching with Sodium Chlorite*

Points dealt with include type of machinery, open width equipment, rope bleaching cotton piece-goods, winch bleaching of knitted fabrics, bleaching nylon and "Terylene," bleaching efficiencies and control of pH

By J. F. BARTON, A.M.C.T.†

SINCE the last war sodium chlorite has been of more and more interest and this is surprising when one remembers that price for price chemically with the traditional processes, it is considerably dearer, but to offset the price differences are the advantages which briefly are, safe and quick bleaching, that is, it is possible to bleach cotton and linen quickly with much less weight loss and low fluidities and in the case of cotton removal of seeds and husks without first kier boiling.

Machinery

Type of machine and the material it is made from are problems. Generally, acid chlorite liquors at pH[4] attack iron, copper, nickel and their alloys. Wood has some resistance but glass, ceramic linings, stoneware, glazed earthenware and titanium are completely resistant. Certain plastics have good resistance but when used to coat metals or wood have generally been found not satisfactory owing to differential expansion and contraction. Most interest lies in the stainless steels rendered corrosion resistant.

Choice of the machine depends largely on each individual factory. For anyone wishing to bleach yarn, the best machine here is the package bleaching machine or package dyeing machine. These are mainly manufactured of stainless steel and several types are available. Those made by Kranz and Longclose are open on one vessel with the bleaching tank closed, and the Thies and Obermayer which are totally enclosed. In both cases the yarn is in the form of a cone or cheese on a perforated former and the bleaching liquor is circulated through the packages both ways.

It is usual to include in the bleaching process peroxide and possibly an acid chemic or perhaps an alkaline boil. Rarely does one bleach yarn, particularly linen yarn, direct without employing another process. This usually means that the stainless steel has a much longer life owing to the fact that the alkaline treatment followed by the acid chlorite is followed by peroxide and then the next process again. The next cycle will start again giving the alkaline and this coupled with monthly pacivation with nitric acid ensures good resistance to attack. Many plants in Northern Ireland bleaching linen yarn with chlorite have been running now for two years and as yet are showing no signs of corrosion or deterioration. They are, incidentally, using sodium chlorite Hoechst which has an advantage over the 80% sodium chlorite in that the nitrate is included.

Recently, a new method of package bleaching developed in Sweden in conjunction with a German firm, employs a liquor to yarn ratio of about 1½ to 1 as opposed to the normal package of 6 to 1. The packages are saturated with cold neutral or alkaline chlorite solutions containing an activator. The excess is removed by compressed air and returned to the stock tank and the packages are then heated by passing a mixture of air and steam through them. The bleach is complete in about an hour (cotton) the packages then being washed-off in the machine. It is claimed that corrosion of the bleaching vessel is avoided by keeping its walls hot enough to prevent condensation of moisture.

When bleaching cloth, the choice lies between rope processing and open width processing. In the rope form there is the immersion, soaking, and steaming techniques. Open width, only the pad steam process is available. Enclosed winches are commonly made from wood or tile lined or lined with glass fibre reinforced with polyester resin or stainless steel.. There are modified kiers and J-Boxes, open kiers are being lined with small stoneware tiles, the circulation system comprising of stoneware pipes with iron reinforcement, stoneware centrifugal pump and direct injection with high pressure steam. A wooden or glass fibre reinforced polyester lid seals the top. The cloth is held under the liquor by a perforated adjustable wooden platform which sits under the lid. J-Boxes are usually constructed of large sections of stoneware reinforced with iron.

Open Width Bleaching Equipment

Here the choice is vast and most machine manufacturers have concentrated their efforts to open width work. If only short runs of cloth are available and with varying widths and qualities, a discontinuous process is better, but continuous plants are an advantage where there are long runs of the same quality. Looking at the discontinuous process first which, in principle, is identical with the fully continuous, the normal procedure is to pad, steam, batch and wash-off. Bleaching usually takes place when the cloth is batched. One of the simplest and most efficient forms of equipment is the enclosed jig. One can pad, steam over four ends and batch for three to four hours wrapping the batch in polythene to stop drying at selvedges; very good results can be obtained. There are several variations on this equipment with padding and steaming combined. For continuous open width processing there is a wide choice of machinery, most manufacturers having entered this field.

In Europe today three different systems of fully continuous open width bleaching installations are working.

In the so-called double batch installation, the material passes continuously through a skilfully arranged system with two rollers. The passage from one roller to the other is automatic depending on the quality of the material. It will run at a speed of 30 - 50 yds./min. and remain on the two rollers 50 - 60 min. Originally this installation was intended for the two-step operation employing firstly, caustic soda solution through the installation, followed by peroxide in the second run. The productive capacity of a two-step installation is reduced thereby to one half so that for full capacity a double installation is necessary. A desired bleaching effect in only one passage by means of sodium chlorite is, however, possible and we have customers who have been working for years with sodium chlorite on such installations. The advantages of this system is that the bleaching time is short, the material is absolutely open width bleached and taken-off without creases.

In another system, the goods are padded in full width, heated in the steamer and deposited in folds on a conveyor belt in the heating chamber. The difference between this system and the horizontal J-Box is that the fabric is conveyed not by its own weight but by a movable belt. Such installations are known in England and, in the case of delicate fabrics, folding plays no important part since the resulting pressure on the fabric is insignificant. The advantage of this system is a short bleaching time and the fact that type and width of cloth or goods are of no importance.

The third system which works on the two-step process, boiling-off and then chlorite. The material is padded with alkali in a roller vat, heated up in a reactor and taken off into a small J-Box with a capacity of 1,000 yds. It remains here for approximately 20 min., and is then washed, acidified, padded with chlorite and the heating-up and depositing is repeated in a second reactor. The plants supplied by machinery manufacturers, no matter what system, are made of the molybdenum containing chrome nickel steel.

Bleaching Procedures

The conditions which have become accepted for sodium chlorite bleaching of cellulosic fibres (cotton, linen, viscose), are pH 4 - 7 at 60 - 100°C. for times varying from 30 min. to 6 hours, with concentrations up to 5 g/l in long liquors and in padding processes 20 - 30 g/l for cotton and as high as 70 g/l for linen. The details apply also to mixture fabrics whether they be cotton/rayon or viscose/acetate. The

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* *From a paper given recently to the Leicester Branch of the Guild of Technical Dyers*

† *Industrial Dyestuffs Ltd., Manchester*

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bleaching bath being prepared in the same way as for cotton.

Suitably chosen conditions cause no measurable oxidation damage to natural and regenerated cellulosic fibres. The general idea is to control wherever possible the evolution of chlorine dioxide so that there is no polution of the atmosphere and also less chance of corrosion; economic considerations are also important. The evolution of chlorine dioxide is controlled entirely by pH and this in turn controlled by activating agents.

Rope Bleaching Woven Cotton Piece Goods

Assume the kier conversion—which is quite popular—has been selected. In this system, introduced by Degussa, open kiers are lined with small stoneware tiles. The external system may comprise stoneware pipes with iron reinforcement, a stoneware centrifugal pump and direct injection with high-pressure steam. The delivery pipe of the circulation system is mounted laterally close to the upper edge of the kier. A deaerating pipe is fitted to the side of the kier to remove any air that might collect in the bottom of the vessel. A wooden or glass fibre—reinforced polyester lid seals the top and is attached to cross beams held on to the kier by four swivel clips. A perforated wooden platform adjustable for height is attached under the lid and holds the cloth down during bleaching.

This type of modified kier can be used to advantage in cotton bleaching by the Degussa system, in which the singed and desized fabric is treated at 80 - 90°C. with 1·2 - 1·5% sodium chlorite (on weight of cloth) at pH 4·0 for 3 - 4 hours washed, given a short alkali scour at 90 - 95°C. to complete removal of waxes, and rinsed.

Continuous rope bleaching of cotton with sodium chlorite can be carried out by the above system in the J-Box plant, where the desized and washed fabric is saturated with the chlorite solutions, squeezed, preheated and steamed at 95°C. for 90 min. in a J-Box of the Dupont type. On leaving the J-Box, the cloth is washed first in alkaline and then in ordinary pure water. In this system there must be sufficient cloth to represent 1½ hours' production of the equipment. According to the size of the plant, so will the production vary, but speeds of 30 to 100 yds./min. are claimed.

The above method is used for bleaching woven or knitted fabrics composed of cotton, spun rayon and even filament rayon, the bleaching consisting of only one treatment. The process gives a full, pure white with excellent absorbent properties. Motes in cotton cloths are completely destroyed in this process, leaving a faultless, perfectly bleached fabric. The cellulose itself is not attacked and the maximum weight loss is only half that associated with other bleaching methods.

Winch Bleaching of Knitted Fabrics

Sodium chlorite is used to advantage when bleaching hosiery goods and knitted fabrics. Any desired degree of white and the required removal of husks can be obtained by varying the chlorite concentration and time. Since the alkaline boiling is dropped, the cotton wax remains on the fibre and the bleached goods come out soft and elastic; the weight loss is also reduced to a minimum. For knitted cotton goods and mixed fabrics from cotton/rayon we recommend that 0·75 to 1 g/l bleaching auxilliary HV and 0·5 g/l Levapon TH highly conc. should be dissolved and added separately to the winch beck with the cloth already running. The pH is dropped to 3·4 with formic acid ensuring that this is the pH of the whole bath, then 1 to 2 g/l sodium chlorite (80%) are added according to the quality of the material and the desired degree of white. The liquor is slowly heated to 70 - 75°C. and bleaching carried out for 1½ to 2½ hours at this temperature. Subsequently, the goods are rinsed warm and cold.

Knitted Goods from Viscose and Acetate

It is advisable in these cases to treat first in a bath containing 1 g/l soda ash, 0·5 g/l Levapon TH highly conc. at 70°C. for 30 min. The bleaching bath is prepared as above but a lower concentration of sodium chlorite is required.

Open Width Bleaching

As this is becoming more important I would like to mention briefly a few of the machines now available. Whilst enclosed jigs are the simplest form of equipment, many machines using the sequence, pad, heat, and batch in an insulated chamber, have been introduced. Typical examples are those constructed by Svenska in Sweden, D.S.F. Gerber, Benteler, Menzel, Renotex and Kleinweiffer in Germany, M.T.R. in France and Stork in Holland.

Steam heating is used before batching, and the chamber is constructed of either pitch pine, polyester resin or stainless steel. Temperatures of 60° to 80°C are used during storage, for times of up to 4 -6 hours. This type of machine gives semi-continuous operation, and when several insulated storage chambers are available high production can be achieved. This method is suitable for lighter weight cotton cloths and also for heavier fabrics which have to be bleached in open width. A typical recipe would read as follows:—

PADDING DRY CLOTH

15 - 25 g/l	80% sodium chlorite
3 - 5 g/l	sodium pyrophosphate (buffer)
2 - 5 g/l	Levapon TH highly conc.
5 - 10 g/l	acetic acid 60% to pH 3·5 - 4

Liquor take up approximately 100%

As a rule, the water content of the goods, the concentration of the impregnation bath and the final squeezing effect should be adjusted to one another so that cotton piece-goods absorb 1·5 to 2% of 80% chlorite on the weight of cloth. This is very important and more so if padding damp cloth, when the amount of water remaining in the cloth has to be deducted when setting the bath and the liquor must accordingly be more concentrated. In this case it will help also if the goods are impregnated about four times in order to ensure a sufficient degree of mixture between the water in the goods and the liquor in the trough.

Further development of this pad-steam process by Benteler and by Smith led to the design of fully continuous plants incorporating ingenious batching devices with double layers of cloth on two rolls. In the Smith machine the double batching is very ingenious. At any one time, cloth is entering the steaming chamber to the top batch cloth running off the bottom batch to the top one, and cloth running off the bottom batch out of the steaming chamber; the cloth is moving in three directions at once. It also means that cloth on the bottom batch, moving on to the top batch has been steamed for something like 20 min., and on the top batch it is being run on with freshly impregnated cloth, so you might say it is having a second look at the chlorite. This double batching technique is very good as long as the cloth width remains the same but, when the widths vary, the bleaching varies around the selvedge.

Instead of using batching rollers Gminder developed a belt-type conveyer for storage of the chlorite impregnaetd cloth during steaming and this machine is made under licence, by Farmer Norton. A related conveyer system consisting of driven rollers is constructed by Benninger. Further machines, introduced by Dungler in Switzerland, use superheated steam at greater than 105°C. which is blown at high velocity through nozzles on to the cloth in order to heat the acid chlorite saturated material. This process has been claimed to give more rapid bleaching with sodium chlorite, than is possible in other types of equipment. It can be said that the use of sodium chlorite as a bleaching agent for cellulosic fibres permits (*a*) shorter processes with lower weight losses, (*b*) direct bleaching of lignified impurities difficult to bleach by other methods and (*c*) minimum risk of chemical damage to the fibre. On the other hand chemical costs are high and may be accompanied by high overhead costs for the necessary machinery. Because of relatively high cost, sodium chlorite must be used in the most efficient way possible.

Nylon and "Terylene"

Chlorite is of special importance in bleaching of synthetic fibres since it can be used on these without the risk of tendering whereas the other bleaching agents cannot be used at all, or only if sufficient care is exercised. This is especially the case where a high degree of white is required which in any case is often only obtainable with chlorite. Generally speaking nylon is produced in a clean state, but wherever preliminary scouring is necessary 1 to 2 g/l of an anionic detergent along with if necessary 1 - 3 g/l soap flakes and 1 - 2 g/l trisodium phosphate. Heat-set material should be scoured for 30 - 45 min. beginning at 104 - 120°F. and increasing to temperature of 203°F.

Material which has not been heat set should be scoured at temperatures not exceeding 95 - 120°F. Polyamide staples for processing on cotton spinning systems are after-treated with a stiffening preparation to impart satisfactory carding and spinning properties. Some preparations of this kind can cause a pronounced yellowing effect in the chlorite bleach liquor and can only be removed in an alkaline liquor at the boil together with a good dispersing agent, i.e., 29/1 Levapon TH highly conc. and 5/1 caustic soda 72°TW. The material is entered at 104°F., raised to the boil, treated for ¾ - 1 hour, then rinsed until all alkali is removed.

Scouring before or after heat setting is a matter of economics. Generally speaking, it is too expensive to scour before setting as one has to bleach the cloth anyway as scoured cloth yellows to a lesser degree when set. Where very brilliant whites are required it is, perhaps, better to scour first. Oil spots on the fabric must be watched. If knitting oil is present on the cloth, it is oxidised on heat setting and on sub-

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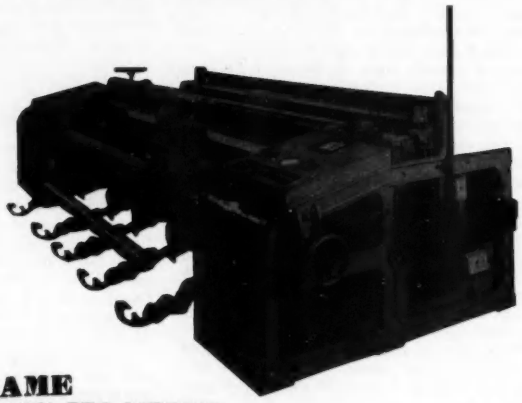

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sequent scouring remains as a yellow stain which may be removed on bleaching but if the cloth is dyed, a greater uptake of dye is noticed in this area. To a commission dyer this is difficult to control but in the case of vertical firms the answer is simple, i.e., keep the cloth clean.

Another point is that when setting long runs, e.g., several thousand yards, the degree of yellowing varies. It seems to come in waves and where this arises it is necessary to ensure the subsequent bleach is such as will give a constant white over the whole run. If this is not done, the shades on dyeing will be affected. One other point, chlorite is very good for stripping disperse dyes on nylon but the cloth strength must be watched. The bleaching usually takes place on the winch beck (V4A) enclosed with a conc. of 1 g/l chlorite 80% and 0·25/1 acetic acid; it has a pH value of 3·5 adjusted by sulphuric acid. In this bath the goods are treated at 80 - 85°C. for 1 - 1½ hours, then are washed in a neutral bath.

The temperatures of the bleaching bath depends largely on the degree of creasing in the winch, and this in turn, on the type of fabric. It may be necessary to add a wetting agent to the bath to stop flotation. Even with careful pH control the evolution of chlorine dioxide is sometimes noticeable and it is therefore necessary to add an auxiliary to counter this objectionable smell. Hoechst have marketed a product—Bleaching Auxiliary HV—which suppresses practically all generation of chlorine dioxide, and this is important in all immersion techniques where large surface areas of liquor are exposed. With Auxiliary HV the pH adjusted at the commencement of the bleaching process is maintained for 2 - 3 hours, and sinks by 0.1 - 0.2 unit after prolonged bleaching times. This decline in pH promotes the bleach effect of the sodium chlorite with progressive exhaustion of the bleach bath. Concentrations vary from 0·5 - 2 g/l depending on the concentration and pH of the bath.

When bleaching nylon delustred with titanium dioxide, the yarn may contain manganese lactate as a spinning lubricant and on bleaching this is changed to manganese dioxide which is brown in colour. It is difficult to remove but can be done by:—

(1) Adding to the bleaching bath Irgalon 330, a product made by Geigy. This helps considerably in the removal of the brown colouration.
(2) This is a very efficient method but needs an extra process. Known as reduction clear, this consists of a separate bath using 0·2 g/l of sodium bisulphite 60% reduction.

Recently, the Lace Research Association published some work carried out to improve the efficiency of sodium chlorite bleaching, particularly with respect to the formation of chlorine dioxide and sodium chlorate. It was claimed that by adding magnesium dihydrogen phosphate to the chlorite bath, the bleaching efficiency is good, with low losses and low corrosion. The decrease in "fuming" was such as to enable bleaching to be carried out in the laboratory in open vessels without the discomfort attending ordinary acid baths even when the temperature was raised from 85 to 95°C.

The quantity required is apparently difficult to assess as the pH of the initial cold bath gives little indication. At present the following is recommended:—

	Water	100 gals.
80%	sodium chlorite	3 lb.
100%	phosphoric acid	2 lb.
	magnesium hydroxide	0·6 lb.

The magnesium dihydrogen phosphate can be prepared immediately before use by stirring the acid and hydroxide with a few gallons of water until dissolved. Then add the remaining water and chlorite and carry on normally. This method certainly works but reports from people who have tried it seem to indicate that it is rather inconsistent and costly. With "Terylene" and acrylics the discolourations of the unbleached fibres are sometimes considerable and often the strong discolourations cannot be completely removed by bleaching even when applying higher chlorite concentration, a higher temperature and prolonged processing times.

To obtain good whites on such stained material an intermediate processing is recommended with 4 c.c./l sulphuric acid conc. 168°TW at 80 - 90°C. for 20 - 30 min. prior to bleaching, followed by rinsing and bleaching with 2·5 g/l sodium chlorite at pH 3·8 using acetic acid for 1 - 1½ hours, then rinsing until neutral. The pH of the water needs to be carefully watched.

Chemstrand have patented a process in which acrylic fibres are bleached by treatment in hot dilute sulphuric acid at 93°C. followed immediately by sodium chlorite solution at 70 - 80°C. for 45 min.

Control of pH

Selection of a suitable activator is controversial, as claims have been made for many different types of compounds but the well known activating agents fall into the following groups:—

(1) Acids.
(2) Sodium salts.
(3) Hydrolysable organic compounds.
(4) Ammonium salts.
(5) Peroxygen compounds.

The most widely used activators are the acids, particularly formic acid; it can be used in all the techniques, immersion and pad steam. A tremendous amount of work has gone into finding an activator which will release chlorine dioxide slowly as the temperature rises, thus controlling the bleaching action and assuring that there is no waste and polution of the atmosphere. Of the activators listed above only the acids and hydrolysable organic compounds are of any consequence. Apart from organic acids such as acetic, formic or oxalic acid (acrylics and polyester) it is possible to use inorganic acids such as sulphuric, hydrochloric or phosphoric, but in practice it has been found best to use organic acids since they are relatively harmless if used too liberally. On the other hand, over activation with mineral acids can easily result in undesired loss of chlorine dioxide and atmospheric polution.

Acetic acid liberates CLO_2 slowly; therefore, for rapid bleaching it is better to use formic acid. For kier and roll bleaching acetic can be used to good advantage. Activation of chlorite liquors with organic esters or substances having a similar action means the bleaching process is less acidic. Generally, these activators are more suited to the pad, steam technique. The use of diethyl tartrate and ethyl lactate have been patented. The advantages of ester activators are (*a*) minimum evolution of chlorine dioxide, (*b*) less danger of corrosion of stainless steel in the pH range of 5 - 7 and (*c*) better working conditions.

Many other organic compounds which develop acidity on heating can be added to chlorite baths. One example is sodium chloroacetate, which is in commercial use. It hydrolyses during steaming with formation of hydrochloric acid and glycollic acid in the material. Economic factors will probably decide which compounds are developed for commercial bleaching.

An activator developed and marketed by Bayer—Axil C—is suitable for the pad, steam technique only but we have had good reports from it in bulk use. It is an alphatic amide, readily soluble in water and replaces acid and buffer substances in the pad liquor.

The pad liquor is slightly alkaline (pH 8 -9) and activation takes place gradually in the heated material, the final pH value is about 5·5. The concentration is usually about 1 g/l for cotton and 0·5 g/l for spun rayon. It has the advantage of giving a practically unlimited stability of the baths at a low temperature and owing to the alkalinity of the bath no development of CLO_2. Finally, one must bear in mind that an activating agent suitable for use under one set of bleaching conditions may not give the best results under all other conditions.

Of all oxidising bleaching agents, sodium chlorite is the most gentle, even in the case of overstrength and excessively prolonged action it does not attack the cellulose. The fluidity number of the cellulose is not altered whereas in the case of sodium hypochlorite bleaching the fluidity is in constant danger. When compared with hydrogen peroxide, the pH has to be very strictly controlled in the case of peroxide to avoid tendering and the removal of seeds is very difficult, but most important of all the pre-removal from the cloth of metallic impurities is vital. The chlorite bleaching baths are unaffected by hard water salts, even in very hard water, no depositions capable of interfering with the dyeing process occur.

INSTRUMENTS IN THE FACTORY. J. Thompson. Department of Scientific and Industrial Research, 5-11 Regent Street, London, S.W.1. (free).

There is still scope for improving instrumentation in most industries and this booklet describes how quite simple instruments can save money and increase efficiency. Thermostatic control of water temperature is a good example. The smoke detector is another. Another example occurs in flow measurement. Often, particularly in smaller firms, accurate measurement of the flow of liquids in manufacturing processes can save a large amount of money. Simple robust methods are available. Similarly, the "thickness" of a liquid can also be measured with advantage.

* * *

WRAPPING AND HEAT SEALING. Well planned and fully descriptive, a booklet issued by British Cellophane Ltd., Henrietta House, 9 Henrietta Place, London, W.1. is especially interesting to all with wrapping problems. It is concerned with the BCL multi-packaging aid, a semi-automatic wrapping and heat-sealing device. Occupying only 22½ × 18 in., it is easy to install (merely plug into an electric power-point) and requires little maintenance. With little training an operative can produce three multi-packs a minute.

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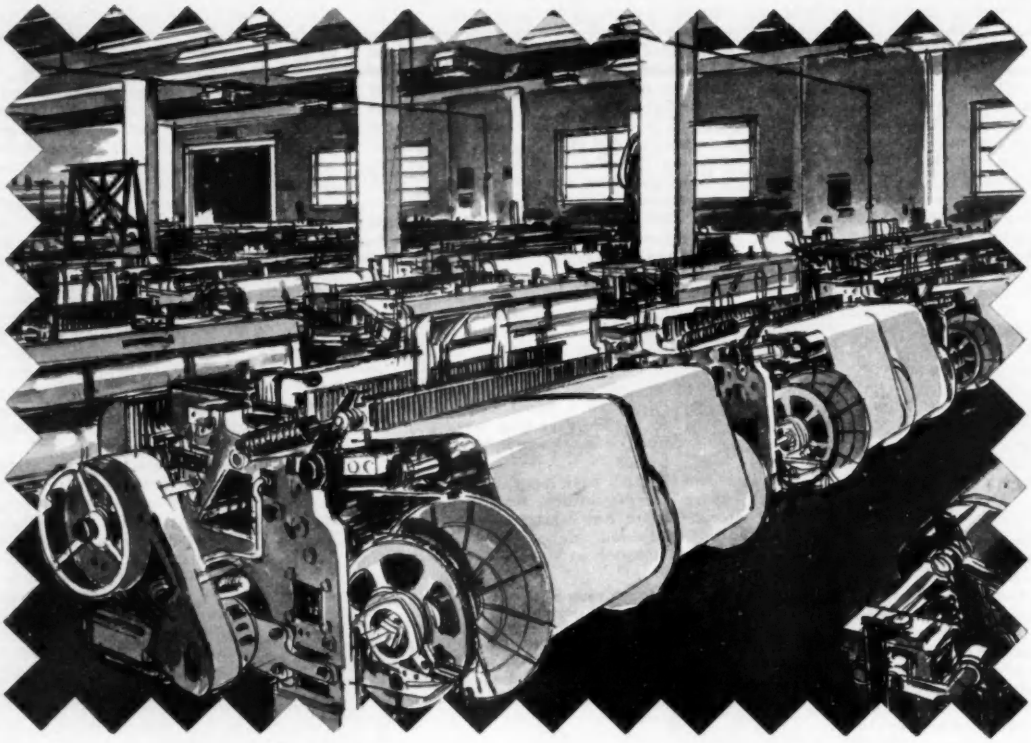

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Recent Trends in The Use of Bulked Yarns*

The weft knitting industry has taken most readily to bulked yarns but there are, obviously, many other possibilities for the exploitation of their properties in both warp-knitted and woven fabrics

By B. C. EGGLESTON, M.A., A.T.I.†

SYNTHETIC fibres, introduced in the form of continuous filament yarn, were quickly found to have advantages over natural staple yarns in certain end-uses. Nylon, for instance, has high strength and abrasion resistance. Its ability to take a permanent set confers dimensional stability and crease resistance and it is immune to attack by insects and mildew. On the other hand, continuous filament yarns give fabrics with less bulk, a colder handle and lower moisture absorption than do staple yarns.

In stockings, some kinds of lingerie and certain industrial products, the low bulk and other characteristics of c.f. yarns compared with staple yarns were either no disadvantage, or were less important than the advantages given by the properties of synthetics compared with natural fibres. In other articles such as woven shirts, c.f. synthetic yarns were used to give ease of care properties and strength, but they did not sufficiently meet the standards of warmth of handle, opacity and moisture absorption set by natural staple yarns. Finally, for some textile products like knitwear and knitted dresswear, a lofty, warm, soft texture is an integral characteristic of the garment, and unless it could be achieved the desirable properties of synthetic fibres had to remain unexploited.

An early solution to the problem was to cut synthetic fibres into staple, and this method has become increasingly important, using both wholly synthetic staple and blends with natural fibres. However, a series of processes has to be used to convert randomly arranged staple fibres into the ordered state in which they exist in yarns. This is unavoidable for natural fibres which (apart from silk) exist only in short lengths, but seems a roundabout approach in the case of synthetic fibres which are made initially in yarn form.

Attempts were therefore made to attain the high bulk of weight ratio of staple yarns by inserting crimp into continuous filament yarns. It was found that such "bulked" yarns could be given many of the properties of natural staple yarns such as warmth, depth of handle and opacity. Their moisture absorption could also be made sufficiently high even with hydrophobic synthetic fibres, as capillary absorption between the fibres plays a large part in wearing comfort. The first aim was to use synthetic yarns in fields hitherto the prerogative of natural staple yarns. Later, it was found that although natural staple fibres have some properties which are not imitated by synthetic bulked yarns, the latter retain many of the virtues of synthetic compared with natural fibres and can be used to advantage by the proper selection of the right yarn for the end-use.

One of the main differences between the various bulked yarns is their amount of stretch, that is the difference in extension between the relaxed state and the point at which all the crimp has been pulled out. The tension required to pull out the crimp also varies according to the type of bulked yarn. These differences are the first consideration in matching a bulked yarn to an end-use, and the various bulked yarns available will be reviewed with this aim in mind.

"Ban-Lon"

The "Ban-Lon" process is similar in principle to one used in the manufacture of synthetic staple yarns, where the yarn is crimped by passing it through a heated stuffer box. The filaments collapse under longitudinal pressure into a zig-zag crimp, which is set into the yarn by the high temperature of the stuffer box, so a thermoplastic yarn is required. Some of the yarn crimp is latent, and is developed fully by a scour-bulking treatment at the fabric finishing stage.

The zig-zag filament crimp gives "Ban-Lon" fabrics a soft, lofty handle suitable for knitwear and dresswear. The yarn has a fairly strong crimp, and a medium extensibility which gives knitted garments a snug fit without making them too elastic.

"Taslan"

Among bulked yarns, the extension properties of "Taslan" most closely resemble those of a staple yarn, as "Taslan" has bulk with very little stretch. It is made by overfeeding a yarn through the turbulent zone of an air-jet where the filaments separate and are blown into loops. As the yarn leaves the jet the looped filaments combine to give a bulky core with some loops protruding from the surface, resembling the surface ends of a staple yarn. The mechanism of filament deformation is purely mechanical so the process is not limited to thermoplastic fibres. "Taslan" has less bulk than some other bulked yarns, but its low stretch and stability to tension make it particularly suitable for weaving, which involves higher tensions than weft knitting. It is used in woven shirts, blouses and dress fabrics to give greater warmth of handle, opacity and absorbency than is given by unbulked continuous filament yarns. The process can accommodate a wide range of yarn deniers and has been used to make carpet yarns.

Twist-Crimp Yarns

If a thermoplastic yarn is given a high twist, heat-set so that the twisted state is stable, then untwisted again, the yarn will contract when the tension on it is released because the filaments tend to return to the configuration they had in the twisted state. Instead of reverting to a twisted yarn, however, the filaments separate and snarl into loops. This twist-crimp yarn has a high bulk with a considerable degree of stretch which may amount to 500 - 600%, and a relatively high tension is required to pull out the crimp. These characteristics make it suitable for stretch stockings which cover a greater range of foot sizes than those from unbulked yarns, for half-hose which combine warmth and absorbency with the long life of continuous filament yarns, and for knitted garments such as swimwear where an elastic fabric is required.

Considerable ingenuity has been exercised in the development of machines for producing twist-crimp yarns. The first yarn was produced on conventional up-twisters, with twisting, setting and untwisting as separate stages. Twisting had to be split into two stages, and further winding processes after untwisting were required to produce the final package, so production was very slow, of the order of 0·5 lb. per spindle per week for 70 den. yarn.

A considerable simplification of processing and increase in production were achieved by the application of the false-twist principle, which allows twisting, setting and untwisting to be carried out in one operation. If a yarn is held at each end and twisted round its own axis at the centre, then there is, say, Z twist on one side of the twisting point and S twist on the other. If the centre of the yarn is released the twist disappears, so this type of twist is called false twist. The process can be carried out continuously by using a twist head, such as a rotating tube with a pin, round which the yarn is wrapped, across a diameter of the tube when yarn is passed through the twist-head, false twist is inserted in the yarn on the incoming side. If this yarn region is surrounded by a heater, the false twist is set into the yarn. On the take-up side of the twist-head the false twist is released, so that untwisted yarn is wound up, which will relax and snarl into filament loops when the tension

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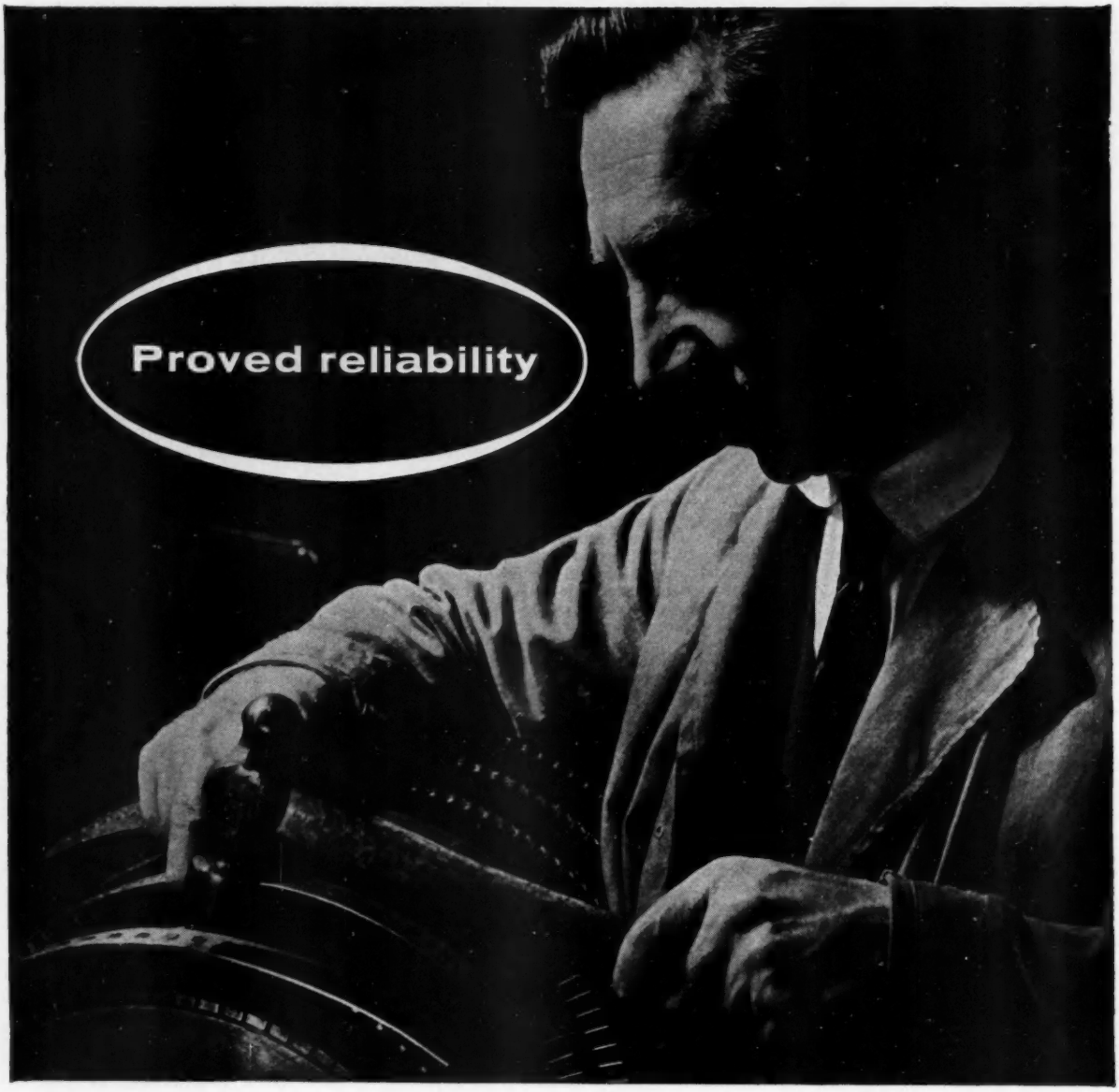
* *A paper given recently to Nottingham Textile Society*

† *British Nylon Spinners Ltd.*

BEHIND THE MACHINE... in small steam turbines



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on it is released. As with "Ban-Lon," most of the crimp is latent at this stage, and is developed by a finishing treatment in fabric form.

The production rate of false twist crimped yarn depends on the turns inserted per in. and the rotational speed of the twist head. The first twist heads rotated at 20,000 - 30,000 r.p.m. giving with 70 den. yarn a speed of 20 - 30 ft./min. and a production of about 1½ lb./spindle per week. Current machines operate at 60,000 - 80,000 r.p.m. with speeds of up to 200,000 r.p.m. on newer models.

A further increase in yarn speed, to several hundred feet per min., was achieved by the friction twisting principle, developed by British Nylon Spinners Ltd. as the E.P.1 process. This method overcomes limitations on twist-head rotational speeds by "rolling" the yarn on the inner surface of a rotating, elastomer-lined bush. A gearing effect is obtained approximately proportional to the ratio of the inner circumference of the bush to the circumference of the yarn.

Quite low rotational speeds of the bush, of the order of 5,000 - 10,000 r.p.m., are sufficient to insert yarn twist at speeds up to 1,000,000 turns per min. Speeds lower than this are used in practice, as at the resulting yarn speeds the limitation is no longer the rate of insertion of twist but the application of sufficient heat for a long enough time to set the yarn. With the aid of specially designed heaters, it is possible to process 70 den. yarn at 300 ft./min. at a bush speed of 3,700 r.p.m. using a bush with an internal diameter of ⅛ in.

While the different production methods give yarns of somewhat different character, they all possess considerable stretch as well as bulk. This high stretch gives perhaps the most striking example of the use of bulked yarns to produce entirely new types of fabric, as the degree of elasticity obtainable could previously be achieved only by using rubber threads. For instance, while stretch fabrics for swimwear are usually obtained by using a knitted structure, it is possible to produce woven fabrics for this purpose, by using stretch yarns to give a degree of elasticity not previously associated with the woven structure.

Edge-Crimped Yarns

The most recent method to be developed for inserting crimp into a yarn is the edge-crimping process used to produce "Agilon" yarn. When heated yarn is passed at an acute angle round a sharp edge, the acute curvature is set into the filaments in contact with the edge. If a monofilament is used, the result is a helical coil in which the direction of the helix reverses at frequent intervals. In the case of a multi-filament yarn the helix is not apparent as such, but a wavy crimp can be seen. As with "Ban-Lon" and twist crimped yarn, a thermoplastic yarn must be used and the latent crimp is developed by a subsequent finishing treatment. The yarn is non-torque, like "Ban-Lon" but unlike twist crimp yarns, so singles yarns can be knitted. "Agilon" yarn has considerable stretch as well as bulk, and has been used mainly in monofilament stockings where it gives an excellent fit and a pleasing matt appearance.

Modified Stretch Yarns

While highly elastic yarns can be used to great advantage in weft knitted garments which are required to fit snugly, such as stockings, half-hose and swimwear, their elasticity becomes a disadvantage in such end-uses as jumpers, sweaters and knitted dresswear, where bulk is required without too much stretch. Not only does knitwear lose its character if it is too elastic but there is also a danger of losing the stitch clarity on which these garments depend for their attractive appearance, as a result of the stitch distortion which occurs when the yarn bulk is developed during finishing. For this reason, several processes have been developed for modifying the extensibility of twist-crimped and edge-crimped yarns without losing much of their bulk.

The principle of these modification processes is to allow the stretch yarn to relax by a controlled amount, and set it by the application of heat into this new configuration. For twist crimped yarns, processes are available in which this operation is performed either separately, by winding the yarn on to a soft package and steam setting it, or as a continuous process immediately following the false-twisting region. For "Agilon" it was found that the temporary set which the yarn acquired on the package made any separate, subsequent relaxing and setting process unnecessarily time consuming if sufficient effect was to be obtained. The "Agilon D" process was therefore developed, in which extra rolls were fitted to the "Agilon" machine to give a region of controlled overfeed, and an extra heater was added to set the yarn in this semi-relaxed state. The resultant "Agilon D" yarn has less extensibility and a stronger crimp than "Agilon."

Outerwear fabrics knitted from post-relaxed twist-crimped and edge-crimped yarns have an adequate but not excessive stretch, and retain satisfactory stitch clarity when the fabrics knitted from them are relaxed during the yarn bulking treatment at finishing. They possess a full, soft handle and adequate opacity and capillary moisture absorption, properties we traditionally associate with natural staple yarns. This achievement demonstrates that many properties of a yarn are a function of the configuration of its filaments, rather than of the fibre material as such or the presence of staple ends. As synthetics these new yarns have the virtues of easy care properties and immunity to biological attack, and as continuous filament yarns they have the advantages of high strength and abrasion resistance, permitting garments to be made which are light in weight and yet have excellent performance in wear.

The producers of synthetic yarns are assisting the diversification of properties obtainable with bulked yarn by providing a wider range of basic yarns. In the case of nylon, the provision of a wider range of filament deniers gives a choice of yarn character within each bulked yarn type. Yarns with 2 den. filaments give a soft, full handle and plenty of cover, suitable for fine gauge women's and babies' garments. Yarns with 3- or 4-den. filaments give better recovery in critical rib and flat-bed structures, and also a firmer handle suitable for medium and heavy gauge men's garments.

In this survey of the ways in which bulked yarns are selected for the most suitable end-use, based on a consideration of their physical properties, the yarns have been allocated to the main fields in which they have so far been used on a commercial scale. However, there are obvious possibilities for the exploitation of their properties in other structure and uses. The weft knitting industry has taken most readily to bulked yarns, but there are many possibilities for their use in both woven and warp-knitted fabrics.

References

"Taslan" is the registered trade mark of E.I. du Pont de Nemours and Co.

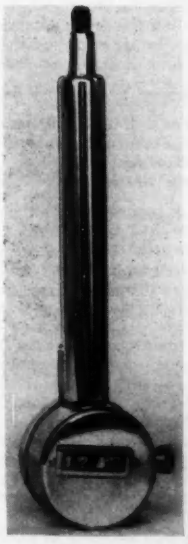
"Ban-Lon" is the registered trade mark of Joseph Bancroft and Sons.

"Agilon" is the registered trade mark of British Nylon Spinners Ltd.

The Hellermann Mark Counter

GUESSWORK and inaccuracy can be taken out of stocktaking with the mark counter, recently announced by Bowthorpe Electric Co. Ltd., Crawley, Sussex. Not only is the stock accurately counted, but it is marked in a fraction of the normal time. This counter, which was shown for the first time at the 1961 A.S.E.E. Exhibition at Earls Court, is an extremely useful device for every storekeeper in every kind of business, whether manufacturing, wholesale or retail.

It is a handy little tool, which is sturdily constructed in chrome-finished steel and is so simple to use that instructions are unnecessary. A simple depression of the felt tip against the bin or stock item to be checked, and the mark counter records the number counted and clearly marks with ink. This means accurate recording and identification in one operation. Each counter is guaranteed and weighs only 7 oz., and is supplied in a strong plastic case complete with five different coloured pens which have an ample supply of ink. New pens can be replaced within seconds.



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Textile Trade and Prospects

Easier Tone in Cotton Markets

Business in yarns and cloths during the past few weeks has not been particularly brisk and no large orders have been put through. An air of uncertainty was plainly noticeable in most transactions created, no doubt, by conjecture on the possible changes or effects of the Budget, also the less settled international situation. Although no apparent piling-up in the pipelines has occurred, there has not been the spate of ordinary repeat business anticipated at this time of the year. Even now, when the details of the Budget are known, there is still hesitancy amongst many traders to commit themselves any further than absolutely necessary. The toneless state of the market has meant a shortening in some order books and certain counts and qualities can now be obtained without much delay. The entire market is more or less dominated by a rigid, inelastic condition lacking flexibility and interest. Despite the featureless market, prices have remained surprisingly firm and inquiries have covered a wide range of yarns but only in relatively small weights. Most of the business has been on home trade account, by far the greater portion being in standard weaving types in the medium count range on cop, cheese, cone and ring-beam. The firm support accorded in recent months to fine, combed, Egyptian-type mule-spun qualities has eased somewhat even although some margins have been pruned a little to encourage off-take. Medium hosiery qualities in single and two-fold have sold reasonably well and coarse numbers are still in good demand. Although blanket and terry manufacturers seem busy enough the inquiry for grey, bleached and dyed condenser yarns has not been as persistent as of late. Mixture yarns continue to sell very well, some in fairly good weights. Bulked varieties find steady support and in novelty types gimps and slubs are in excellent demand.

The bulk of home trade cloth orders have been for smaller quantities of apparel types and this contrasts sharply with the eagerness of some merchants and shippers to increase the imports of foreign cloth from Hongkong, India, and one or two Continental countries. Orders in general have been fairly well distributed in machine and screen printed dressgoods, and in woven designs jacquard weft-mixed styles have met with good response. In shirtings, the off-take has been mainly in neat fine-ribbed cotton cloths, subdued stripes and small checks. Piece-dyed pastel shades have lost favour but the demand for nylon shirtings remains good.

In household textiles customers have not been anxious to buy too far ahead but replenishments have been fairly steady. Prices and delivery dates are probably the main braking forces at the moment and in no single instance is this more true in its effects on overseas buying. Home trade off-take has centred around moderate orders for sheetings, quiltings, cotton and cotton/nylon blankets, and coloured-woven tablecloths. In towellings, high quality Italian imports have made their impact amongst the more expensive cloths, in that the colourings and designs have excellent sales appeal. Some of them are, indeed, masterly examples in terry fabric constructions. Medium quality towels sell relatively well but the interest in roller types has fallen appreciably.

In export circles, small orders have trickled through for certain specialities and the business in industrial cloths has been rather patchy. Most markets lack a stimulating influence.

Wool Trade Activities

A tentative programme issued by the National Council of Wool Selling Brokers of Australia, fixes the opening of 1961-62 wool selling season in Sydney and Melbourne on August 28 and in Freemantle on August 29. Imports of wool into the U.K. in February were 60·3 million lb. (actual weight) compared with 50·7 million lb. in February last year—an increase of 16%. Trade and navigation accounts of B.o.T. also show that, during the first two months of 1961, wool imports into the U.K. totalled 139 million lb. or 8% more than the figure in the same period in 1960. Larger imports may be partly due to the fact that—according to figures issued by the Wool Industry Bureau of Statistics—stocks of wool in the U.K. at January 31 were 232 million lb. (clean weight), or 31 million lb. lower then a year earlier.

Britain was overtaking France as the main buyer of South African wool at the end of February—two-thirds through the current season—after heavier purchases than in previous months. French buvers took 30·7 million lb. of greasy and scoured wool by the end of Februarv, as against 30·1 million lb. by the U.K. which has long been the chief customer of South African wool. Third as a buyer was Germany, with 27.4 million lb. The South African Wool Commission reports that income from the clip until the end of February was £34 million, as compared with £40 million at the same stage in 1960. Average price at 37d. a lb. was 5d. down. Because of the continued drought, offerings dropped from 833,000 bales to 796,000. Owing to a market improvement in February the commission bought in less than 9,000 bales, making a total of 101,000 bales—13% of total offerings—for the season.

Men's all-wool clothes to be presented by the National Wool Textile Export Corporation at the British Trade Fair, Moscow, from May 19 to June 4 will reflect the "London Line" and embrace a wide range of well-designed wool fabrics Fabric designs and colours to be featured include multi-coloured Irish check tweed; Scottish Cheviot in "London Lovat"; a classic blue chalk-stripe worsted flannel; black-brown fine Huddersfield worsted with an olive Glen Check design; brown and green bird's eye Huddersfield worsted with a single line of deep gold overcheck; grey check Scottish tweed; black and brown fancy striped Huddersfield worsted; Scots twist cloth in a bold check design; black and white Glen Check Saxony and Scottish lambswool. This range of cloths, illustrating the modern outlook of wool textile designers will appear in topcoats, suits and sportswear modelled in Moscow by three London men's wear models. Fifty-thousand copies of a British wool textile brochure, printed in Russian and illustrated in colour, are also on their way to Russia and will be distributed to the public from the Export Corporation's stand. Brochure colour plates of some exhibits show suitings, dress cloths, overcoatings and sports wear fabrics. An objective is to show how the industry caters for every fashion in outerwear.

Some pictures of wool processing machinery in operation are included because of the interest of Russian people in mechanical and industrial techniques. Photographs of knitwear fashions indicate the Hosiery and Knitwear Export Group's association with the venture.

Linen Trade Review

The publicity given in political circles to the adverse effect of linen imports on demand for domestic products has undoubtedly tended to distort the actual facts. These were brought into perspective by the Minister of State, Board of Trade, when he stated that current quotas for linen goods from Eastern Europe represented only £200,000 in value, with some additional cover for "household goods." The total, he maintained represented a small percentage of the linen industry's exports which, at current level, are running at £15 million per annum, with total production several times that amount. He said that it would be impossible to make reasonable arrangements with 'Iron Curtain" countries if they were refused the opportunity to sell products which they had been exporting to this country for many years and which could be imported freely from all other countries in the world excepting Japan, over a tariff. If the volume of imports became a serious threat to the industry the Government would be very willing to consider a case for acting under the anti-dumping legislation. If it would help the industry he would be prepared to consider negotiating volume quotas, where there was an important advantage in doing so.

Competition of this nature is not confined to the linen trade nor, as the Minister pointed out, is it of recent origin. It does, however, assume increasing importance as overseas markets contract and the industry becomes more dependent on home demand. The linen trade has got to adjust itself to the ever changing world economic pattern if it is to survive.

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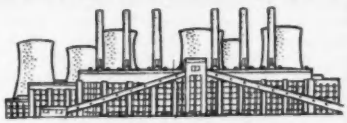

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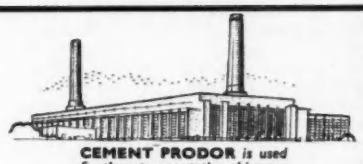

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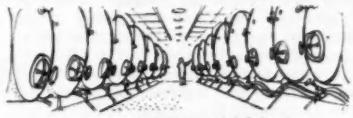

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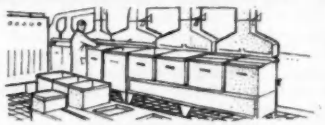

P.V.C. *fabrication scheme for fume extraction*

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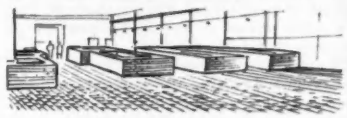

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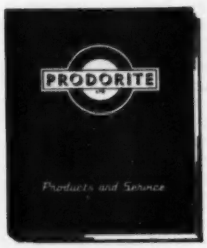

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Protection from without is impracticable. The germ of survival must be nourished from within, and made adaptable to environmental changes. The factors determining survival are fundamentally the same for an industry or firm as for the individual.

Exports for the last quarter of 1960 showed a slight improvement on the previous period, but orders received went down by approximately 10%. This is reflected in conditions in the industry to-day where most firms, and particularly those in the spinning end, have had to reduce production. Flax yarn exports have dropped considerably, and as these were formerly substantial to the E.E.C. area future prospects in this market are less favourable, even though revaluation of the West German mark may give some relief. N. Ireland producers of wet spun yarns are concerned at the growing volume of imports of these in recent months, mainly from France, where producers have a definite advantage in overall costs, partly as a result of adopting new techniques where these have proved more economical than traditional processing methods.

Dry spinners continue to benefit from the misfortunes of the jute industry and have considerable forward bookings in competitive lines. Demand has slackened for line yarns as manufacturers of the range of products in which these are used face increasing competition from man-made fibres. While linen still retains an immediate price advantage this is being offset by long term considerations including serviceability, ease of handling and storage in the case of canvas covers and tarpaulins.

Flax prices continue firm in West European markets. While purchasing by and for British mills has eased Continental spinners are still covering against their heavier commitments. Material on offer is limited in bulk and quality, the latter being principally in the lower grades. Most of the labour force in the scutch mills has been diverted to field work as stocks of retted straw become exhausted. The 1961 crop has got off to a good start in most areas. Sowing was effected in favourable conditions and the brairds are making good progress. It is too early as yet to say just how the acreage in West Europe will compare with that of last year, but reports from different districts indicate little change. No worth while sowing has been recorded in Ireland, so that the British linen industry will be completely dependent on Continental suppliers for its requirements, with all the uncertainties and risks that this implies.

Jute, Yarn and Cloth

In the second half of March the raw jute market in East Pakistan became easier and E.P.C. levels were reduced on many occasions. This quieter market was due solely to a lack of demand from the main consuming countries. With prices at a very high level for the past six months spinners are careful not to be caught with large stocks of raw material when the market begins to fall. With this in view, spinners are allowing their jute stocks to run down to as low a level as possible and so far as the U.K. is concerned it is unlikely that much further buying of old crop material will take place.

The progress of the new crop is also influencing the position. Sowing of the lowland areas are now completed and these are reported to be 50% greater than last year. However, the lowland area only accounts for about one quarter of the whole crop. Sowings are going ahead in the midlands and everything points to a large crop in East Pakistan this season which should bring prices back to a more realistic level.

Offers of new crop are already being made but so far they have not attracted much attention from spinners. The weakness in the market is very evident and spinners are waiting for a further fall in values. Mill Lightnings have been offered at £160 and Mill Hearts at £155 for Aug./Sept. shipment and £10 per ton less would be accepted for shipment a month further ahead.

The difference in price between old and new crop fibre this year is very great, but this is only to be expected with the very high prices which have been in force of late due to the small crop last season. If demand should spring up for April/May/June shipment old crop, this could raise prices as the supplies available are very limited, but on the other hand it is not expected that this would influence prices of new crop fibre to any extent. The main factor ruling the new crop position, is the weather conditions during the next three months.

With prices of yarns and cloth in the U.K. being held at a very low level and more or less based on the average costs of stocks of raw material held by spinners, it is uneconomic for them to make purchases of jute for current shipment. So far as the new crop is concerned, the position is still very speculative and buyers are reluctant to pay the prices asked.

Offers of old crop are being made at £198 for Mill Firsts, at £190 for Mill Lightnings, at £185 for Mill Hearts and at £180 for grade Hearts, c.i.f. U.K., for April/May shipment. Grade Tossa-2/3 is named at £194, grade Tossa-4 at £188 and Continental Tossa-2/3 at £185, April/ May. Offers of cuttings are still very scarce with S.N.C. at £132 and N.C. at £125.

A fair amount of afloat jute is available at present and holders of these parcels are discounting the market but so far as the U.K. is concerned no interest has been shown but a little movement has taken place to Continental countries. It was expected that a scramble would take place for raw jute towards the end of the season, but so far this has not been the case possibly due to reduced demand for yarns and cloth.

The Calcutta goods market has also become much easier during the past month. The prices quoted have been very irregular with a wide difference between sellers. Demand at no time has been large but a fairly steady offtake was seen. Quotations are at 93/6 for 10 oz. 40 in., and at 70/- for 7½ oz. per 100 yds. f.o.b. Calcutta for April shipment, at 93/- and 69/6 May and at 92/6 and 69/- June. B twills were at 271/3, 268/3 and 265/3 for the respective shipment periods. Business has been taking place to the U.K. for the June shipment period as the rates asked have been attractive.

India is also taking steps to increase the outturn of her jute crop this season as on this depends prices of finished goods. It has been decided with the full approval of the Government to set up a special Jute Development Section to establish areas of intensive cultivation in the jute growing areas to show farmers in a practical way what can be achieved by the use of improved seeds and modern cultivation techniques. It is felt that growers need very little inducement to sow jute this year and the main task has been to ensure that seeds and fertilisers are available in sufficient quantities.

Demand for yarns and cloth at Dundee has been considerably reduced of late. This is normally a quiet time of year in the jute industry but the high prices now in force and the recent easier trend in raw material prices has not helped the position. Not only has there been a lack of new business but delivery of contracts already placed have been slowed down. This has been reflected by a reduction in output in Dundee and a fair amount of short time working is now in force.

Silk and Man-Made Fibres

Slightly easier trading conditions are noticeable with yarn suppliers able to offer most quality types without delay. Yarn producers and staple spinners have well filled order books in most cases but demand from the Midlands for hosiery qualities has slackened because of the growing volume of imported goods.

Silk is undoubtedly booming as far as dress fabrics are concerned and this is a happy augury for the forthcoming Silk Congress; acetate is also in demand. The business negotiated in corset fabrics has been encouraging, especially in nylon with new constructions and finishes which give the feel and appearance of silk. Foam backed fabrics are very much in the news at present. Similarly, lining manufacturers find the current vogue for decorative linings is bringing good orders and the bright reds and blues required for lining men's showerproof coats, are keeping dyers pretty busy. Acetate taffetas are in steady request, a demand which may continue for some time ahead.

In Yorkshire areas demand for dress-goods in acetate/cotton blends and in "Tricel" remains very good, and there is the usual steady demand for wool/"Terylene" blends. "Courtelle" increases in popularity in the knitwear trade and the demand is quite substantial for double jersey fabrics. The off-take for carpet yarns is slightly less with reports of a little short-time working in some tufting quarters but the lull is expected to be only of short duration. Demand for wool/"Terylene" suitings continues good.

Macclesfield throwsters report a growing demand for silk, and bulked yarns remain in steady request. Weavers are reasonably busy but printers are less active. Commission dyers and finishers are busy under the prevailing conditions. Trade in Leek continues good but the business in half hose is rather slow—not unusual for this time of year, however. Consumption of textured yarns for knitted outerwear remains good. Light clothing manufacturers are reasonably busy with steady prospects in the immediate future. Novel trimmings continue to sell well.

Among Midland manufacturers the demand for seamfree hose continues and tends to increase. Hinckley manufacturers report a steady demand for mesh types. On the whole, outerwear manufacturers are busy but one difficulty the whole time is the threat of imports from overseas which tends to stiffen resistance from wholesale and retail sections. The demand for half-hose has fallen but is not unexpected at this time of the year.

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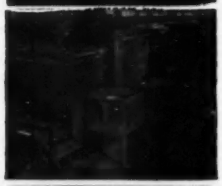

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Notes and News

Scottish Tweed Production

Production of Scottish tweed fell by 5½% during 1960, it was announced at the recent annual general meeting of the National Association of Scottish Woollen Manufacturers in Edinburgh. A drop in exports from 10,177,000 sq. yds, valued at £8,099,000 in 1959 to 8,716,000 sq. yds. yielding £7,256,000 last year was partly offset by increased deliveries to the home market. These rose to 11,977,000 sq. yds. an increase of 286,000 sq. yds. compared with 1959. Almost two-thirds of the drop in exports were accounted for by lower sales to Canada and the U.S. where the tariff quota was exhausted by March 3, 1960, deliveries during the remainder of the year being restricted by the tariff of 45%. Dollar earnings from cloth alone fell by more than $3,000,000 to $9,346,000.

The retiring president, Mr. John Ballantyne, said: "In Canada the cause of the drop was economic; in the United States it was largely political. Our sales to the 'Six' increased and accounted for 29% of our exports. This might look as though we are keeping our end up, but in fact it is a dangerous situation. The internal reduction in duties only started January 1 but already, for example, some of our German customers are telling us that in spite of all the goodwill that exists and the superiority of our products, they will be forced to look to Italy for supplies unless we can be linked with the Common Market." Mr. Ballantyne added that sales to the 'Seven' increased also, but the market potential there is not so great, "so one cannot help getting impatient about all the negotiations which never seem to get anywhere."

* * *

New Appointments

Arising out of the death of Mr. G. Hardman, Managing Director of Textile Machinery Makers Ltd., Oldham, Mr. F. G. Hawkings has been appointed managing director and Mr. E. G. Smalley deputy managing director of the company.

• • •

Nigerian Factory Projects

The possibility of two factories being erected in the Zaria area, is reported from Nigeria by Barclays Bank D.C.O. to be under serious consideration. One project is a joint effort of the Northern Region Development Corporation and the United Africa Co. of Nigeria Ltd. for the manufacture of hessian bags. The other would be a cotton seed crushing mill in which Lebanese interests are involved.

* * *

Recruitment Scheme for Huddersfield Mills

A new training scheme has been launched to meet the special requirements of Huddersfield. An extension of the scheme already operated by the Wool Textile Employers' Council, it has been introduced by the Huddersfield Woollen and Worsted Federation. The scheme is based on the principle that the industry is a vital part of the national economy, and must fulfil its obligations to the community by accepting the implied responsibility. Each participating firm (the Federation has 120 member-firms) will agree to meet short-term disadvantage so that long-term advantages may accrue.

The entrants best interests will at all times take precedence over the immediate requirements of the firm concerned. Entry into—and progress through—the industry during training will be determined by age, ability and intelligence, and widest practicable training will be given, consistent with ability. Co-operation by the local college of technology is an important part of the scheme.

* * *

Dyeing Company to Close

Bradford Dyers' Association Ltd., announce they have decided to transfer the business carried out at Parkside Dyeing Co. Ltd., Thornton Road, Bradford to other branches of the Association following negotiations with the Cotton Board arising out of the Cotton Finishing (Woven Cloth) Reorganisation Scheme Order 1960. The closure of Parkside will be deferred until the end of August and this will enable arrangements to be made for the transfer of employees to the other branches selected to absorb Parkside's trade.

* * *

New Appointment

Mr. D. L. Crouch (publicity manager, I.C.I. Fibres Division), has been appointed London promotions manager, a new appointment instituted to strengthen marketing operations. He is succeeded as publicity manager by Mr. A. L. Sumner, formerly assistant publicity manager.

* * *

Change in Representation

Mutual Mills Ltd., and Mutual (Filaments Division) Ltd., Heywood, have appointed W. G. Peet (Yarns) Ltd., 52 High Pavement, Nottingham, to be their sole agents for the Midlands. This follows the retirement from the textile trade of Mr. G. Baxendall, of Alfred E. Baxendall Ltd., 42 Southgate St., Leicester.

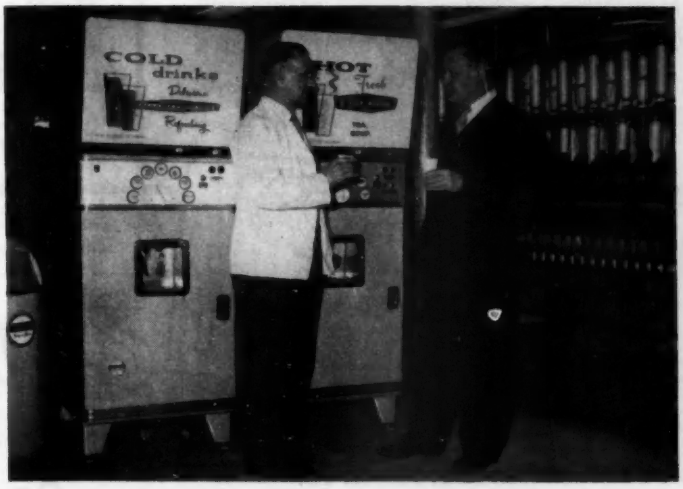
* * *

Instron in England

Instron Ltd., announce that Instron precision testing equipment is now being made by Instron Ltd., at their new factory in Halifax Road, High Wycombe, Bucks. Instron equipment was first developed by Hindman and Burr, Research Associates at the Massachusetts Institute of Technology, for specialised war-time applications. At the end of the war the inventors established Instron Engineering Corporation, Massachusetts, and Instron test equipment rapidly achieved world-wide fame. The number of Instron machines installed in Great Britain is reported to be growing rapidly and the new U.K. factory offers a range of equipment for material testing, providing the high precision and versatility. Two basic Instron models measure tension, compression, hysteresis and elastic modulus of virtually all materials, including all metals, plastics, natural and synthetic fibres, rubber, textiles, wood, paper, glass, etc.

D-Day in Bolton

March 16th was D-Day in Bolton, for on that day Ditchburn Vending Machines Ltd., installed their Hotspa and Colespa drink vending machines in the mills of Musgrave Spinning Co. Ltd., and James Marsden Ltd.,—the first to be installed in the cotton industry in Bolton. The photograph shows Mr. William Howarth, general manager of Musgrave's and Mr. Harry Bonney, ring room overlooker, trying the first two drinks from the Hotspa in the No. 1 Mill. Mr. Howarth said "because freshly-made drinks are available at any time, this greatly simplifies our catering on shift working."



The job is easily done and quickly too with... 'Quick-Wrap'

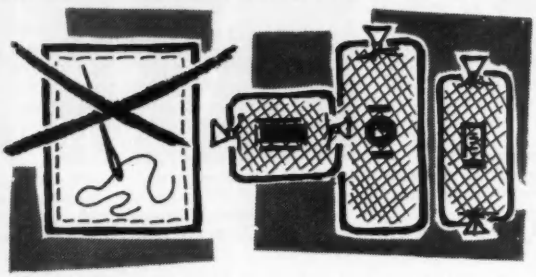
HESSIAN TUBING

Ease and speed save your money and in these days of tough competition—you just can't afford to be without 'Quick-Wrap'

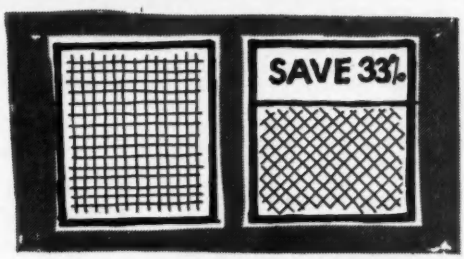
HERE ARE THE FACTS:—

'Quick-Wrap' Hessian tubing is delivered to you already sewn into tubes of over 11 different diameters and in lengths of approximately 160 yards.

'Quick-Wrap' being sewn on the Bias makes a neater package because it moulds itself to your products.



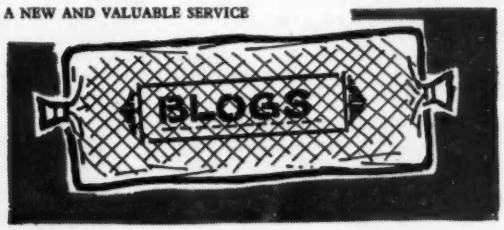
'Quick-Wrap' means you can wrap 3 to 5 parcels of goods in the time it takes to hand-sew one.



'Quick-Wrap' means less wastage, you use about 33% less Hessian and the tubes can be used time and time again.

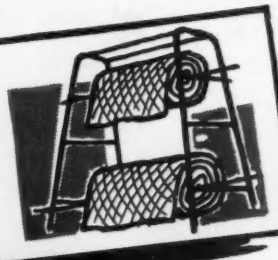
'Quick-Wrap' can be operated by unskilled labour in five easy, quick steps.

A NEW AND VALUABLE SERVICE



'Quick-Wrap' can be supplied with your Company's name or product or an advertising slogan.

'Quick-Wrap' *can be mounted on the dispenser illustrated (supplied by Quick-Wrap Tubing Co. Ltd. at a nominal cost) for easy application.*



✱ Get to know more about 'Quick-Wrap', write or phone for the illustrated leaflet which tells you how to pack better all round.

'Quick-Wrap'

HESSIAN TUBING—

Packs better all round

QUICK-WRAP TUBING CO., LIMITED
Jute Mills, Bow Common Lane, London, E.3.
Telephone: EAST 3033
Suppliers to the Admiralty and Ministry of Supply

New Appointments

Two well-known members of the staff of Shirley Institute, Dr. I. H. Thomas and Mr. A. E. De Barr, head of the spinning department, have left to take up new appointments. "Doc" Thomas joined the staff in 1936, and has spent his entire working life in studying weaving and its associated problems. Not only has he become an authority of world wide repute on weaving mechanisms but he was also responsible to a large degree for the design and production of the Shirley Loom. Happily, as Dr. Thomas has been appointed to Manchester College of Science and Technology as senior lecturer, his deep knowledge of weaving will not be lost to the industry.

Mr. De Barr joined the staff in 1953 and has distinguished himself not only by some penetrating theoretical studies related to the spinning of fibres but also in numerous practical applications of the results of such studies. He has taken up an appointment as the first Director of Research of the newly formed Machine Tool Research Association, in which capacity his endeavours, whilst impinging less directly on the activities of the textile industry, will no doubt bring considerable indirect benefit.

* * *

Man-Made Fibre Production

According to statistics issued by the British Man-Made Fibres Federation, production of filament yarn and staple in March totalled 47·52 mn. lb. compared with 43·13 mn. lb. in February but with 54·64 mn. lb. in the all time record month of March 1960. At 23·52 mn. lb. production of filament yarn compared with 20·79 mn. lb. in February and 24·26 mn. lb. in March last year. Because February is a shorter month a noticeable increase in March was to be expected, but in filament yarn March, though well below the record attained last year, was the best month since May 1960, when the total was 23·54 mn. lb. At 24·00 mn. lb. in March, compared with 22·34 mn. lb. in February and 30·38 mn. lb. in the record month of March last year, production of staple reflects the recent rather quieter trend in demand for staple compared with the hectic state of the market a year ago. Actually, the daily rate of staple production was slightly down compared with February. Meanwhile demand for filament yarns is maintained at a satisfactory level in both cellulosic and synthetic types, but there is no general improvement in demand for rayon staple, though the offtake of synthetic fibre staples is relatively good.

Million lbs.

	C.F. Yarn (Singles)	Staple	Total
1960 Jan. ..	21·79	29·01	50·80
Feb. ..	22·24	28·04	50·28
Mar. ..	24·26	30·38	54·64
1961 Jan. ..	23·35	25·26	48·61
Feb. ..	20·79	22·34	43·13
Mar. ..	23·52	24·00	47·52

* * *

Textile Institute President

Lord Barnby, a world figure in the wool textile industry, has been elected president of the Textile Institute in succession to the Earl of Derby. He took office at the Institute's annual meeting in Edinburgh on April 20. Lord Barnby, who is chairman of the Aire Wool Co. Ltd., of Bradford, and has textile interests in several parts of the Commonwealth, is a member of the advisory committee of the International Wool Secretariat.

* * *

Production and Sales Maintained

Mutual Mills Ltd., Heywood, worked at full capacity during the past year, according to Mr. G. Livsey, the chairman, in his annual report. Although No. 1 mill was closed under the Cotton Reorganisation Scheme the remaining plant, working double shift and day and evening shift, had so far exceeded the production of previous years.

Sales of yarn were well maintained, although signs of over-buying were now evident, which may cause a drop in seasonal demand. Apart from standard synthetic blends, the company had made much progress in the development of colour spun ranges in "Acrilan", "Courtelle," nylon, "Terylene," and "Tricel." Much development work had also been put into the marketing of a new Bri-lon yarn for the outerwear trade under the trade-mark "Amatalon."

* * *

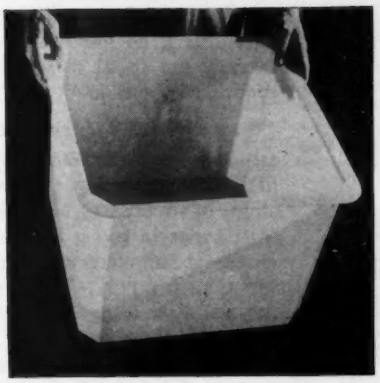
Israel Cotton Production

Some 37,500 acres of cotton will be sown in Israel this year reports Barclays Bank D.C.O. from Jerusalem, increasing the national cotton acreage by 50%, in keeping with the overall expansion programme implemented since 1955. Whilst local cotton requirements were covered for the first time last year, it is planned to export this year a 5,000 ton surplus.

* * *

High Density Polythene Tanks, etc.

Tanks, boxes, pirn traps, and many similiar items are now fabricated from Rigidex high density polythene sheet made by British Resin Products Ltd. It is a tough material, providing rigidity and resistance to boiling water, chemicals, oils, greases and solvents. The example shown here was manufactured by Spembly Ltd., Manor Road, Chatham, Kent.



"Terylene"/Cotton Belting

ONE of the longest above-ground conveyor belts in the country—over 2,000 ft. in length—relies on "Terylene" for its strength. Made 24 in. wide, it carries up to 200 tons of sand and gravel an hour at the Midland Gravel Co. quarry, Bodymoor Heath, Sutton Coldfield. Constructed by Barrow, Hepburn and Gale Ltd., from a 4-ply "Terylene"/cotton fabric, the rubber-covered belt is not only stronger than the cotton belts previously in use but it is stated to be cheaper.

When Midland Gravel Co. decided to change over to a "Terylene"/cotton fabric, the whole conveyor was redesigned by Mining Engineering Co. Ltd. to take full advantage of the strength and flexibility of the new style belt. Previously three belts and two transfer points were necessary. These have now been replaced by one belt, saving the wages of two men. Now one man is stationed at each end of the belt and keeps in touch by field telephone.

Replacing two previous transfer points, this new conveyor—over 2,000 ft. in length—now only requires two men, stationed at each end, to attend to it. They keep in touch by telephone

CUT HERE

Speed control of Electric Motors

'Variable' speed may involve two or three (or more) speed steps or infinitely variable (stepless) speed control. It is this latter type which is considered below. Of the many advantages of electric drives, the opportunity offered for infinitely variable speed control is outstanding. Unfortunately this advantage is not used as much as it might be to increase the speed of working, and to improve productivity and quality.

Principal Factors Affecting Choice of Drive

(a) First cost, (b) Efficiency, (c) Speed range, (d) Regulation, (e) Power-to-weight ratio, (f) Availability of supply, (g) Maintenance and reliability, (h) Change in power and torque over the speed range, (i) Simplicity of control gear, (j) Effect of variation in supply, (k) Power factor, (l) Characteristics of the load, (m) Operational environment, (n) Braking requirements.

This list is not meant to be all-embracing, for there well may be factors not mentioned which could prove conclusive in the choice of a drive.

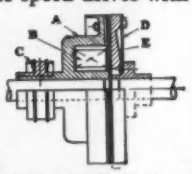
The following are some methods of obtaining infinitely variable speeds:

Alternating Current Motors

The vast majority of electric drives in use today employ A.C. motors. Although not quite so flexible as D.C. motors in the matter of speed control, there are available many types which give a large measure of speed variation.

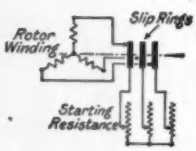
INDUCTION MOTORS. Although the squirrel-cage motor is essentially a constant-speed machine, it is much used for stepless variable speed drives with one of the following types:

(a) Eddy-current coupling,
(b) Ferro-magnetic particle coupling,
(c) Mechanical drives, e.g. belt drives and friction drives,
(d) Hydraulic variable speed drives.



A, Magnet body; B, Magnet coil; C, Collector gear; D, Spring plate; E, Armature.

SLIP-RING MOTOR. The slip-ring motor, which costs more than the squirrel-cage motor, can be varied in speed by means of the resistors in the rotor circuit used for starting. The amount of resistance in circuit can be varied in steps by means of different forms of control gear operated by hand, push-button or automatically controlled contactors.



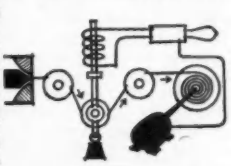
A.C. COMMUTATOR MOTORS. These are three-phase induction motors provided with additional windings which, through a commutator and brushes, permit speed adjustment in either direction below and above synchronous speed. The brush gear can be automatically controlled so as to vary the speed according to a known programme or cycle of operation such as in spinning frames. The Schrage and similar motors are refinements of this type.

Ward-Leonard System

In this system the armature of a D.C. motor is supplied at variable voltage from a separate generator. The generator may be driven by an A.C. or D.C. motor directly coupled to it and to an exciter which supplies the field windings of the generator and main motor. By means of a potentiometer resistance, with mid-point connected to one terminal of the generator field windings, the generator voltage may be varied from maximum to zero.

Electronic Motor Control

Motor speeds can be controlled accurately by electronic methods. Such drives can respond in any desired manner to variations in one or more variables and several drives can be interlocked so that their speeds are always in the same ratio. A typical application is on several separate conveyors. The system can be speeded up or slowed down from a 'master' controller, but for 'running in' purposes the speed of each drive can be individually regulated. Electronic speed control has been successfully applied where human control is not possible, e.g. in register control. In this example print must always be placed at exact positions on packaging material. The sketch shows electronic control of wire tension in drawing operations.



Direct Current Motors

While it is unlikely that a mains supply of D.C. will be available, the striking advantages of D.C. motors sometimes make it worth while installing a rectifier, e.g. a motor-generator set, a mercury-arc or a semi-conductor. The speed of D.C. motors is easily controlled by inserting a resistance in series with the motor. Although this can result in a certain amount of wasted electricity, the benefits derived will often heavily outweigh such losses.

For further information get in touch with your Electricity Board or write direct to the Electrical Development Association, 2 Savoy Hill, London, W.C.2. Telephone: TEMple Bar 9434.

Excellent reference books on electricity and productivity (8/6 each, or 9/- post free) are available —'Electric Motors and Controls' is an example.

E.D.A. also have available on free loan in the United Kingdom a series of films on the industrial uses of electricity. Ask for a catalogue.

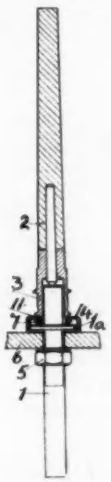
RECENT TEXTILE PATENTS

These abridgements are republished from specifications by permission of the Comptroller of H.M. Stationery Office. The full specifications can be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2. Price 3s. 6d. each (accompanied by remittance).

832,947 Improved Twisting and Spinning Spindle

ZINSER TEXTILMASCHINEN G.M.B.H., *Ebersbach/Fils, Germany.*

A holding down device for twisting and spinning spindles. There is provided between the spindle bolster 6 and the flange 1a of the spindle 1, a deformable sleeve 4, clamped in position by means of the nut 5 below the bolster. This



sleeve engages around a collar 7 provided on the spindle wharf 3 and thereby holds down the part 2 of the spindle when drawing off the yarn package. As the sleeve 4 engages over the wharf, it prevents the penetration of fly into the gap 11 between the lower part of the spindle and the bore of the wharf 3.

833,697 Non-Woven Fabric

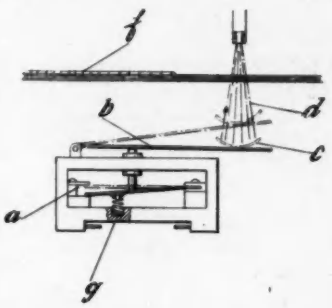
A. H. DRELICH, 60 *Parkside Road, Plainfield, New Jersey,* AND H. W. GRISWOLD, *Russell Road, Princeton, New Jersey, U.S.A.*

Relates to fabrics produced directly from fibres without the necessity for conventional spinning, weaving or knitting. This fabric comprises a web of relatively loosely assembled overlapping and intersecting fibres extending in diverse directions generally parallel to the central plane of the fabric and relatively small closely spaced areas of bonding material in the fabric parallel to the plane and in accordance with a predetermined pattern. Preferably, the fibres are relatively soft and flexible and in the order of normal textile length although shorter fibres may be used. The desired softness and drape is obtained by preserving as much as possible of the softness and drape of the fibrous layer as it existed before bonding.

833,736 Control Device for Conveyors

THOMAS BROADBENT AND SONS LTD., *Central Ironworks, Huddersfield.*

An improved sensitive switch control arrangement for use in machines where control is effected by the passage of lightweight material, on an endless conveyor as, for example, in folding machines for laundry flatwork. The switch *a*, has an actuating arm *b* with a small cup *c* arranged at its free end on to which an air jet *d* is directed to overcome the action of a light spring *g*. When the materials *f*



intercept the air jet the spring g takes control of and closes the switch. If the fabric fails or there is a break between lengths of fabric, the jet will play on the cup on the switch arm and overcome the spring when the switch will be opened. The pressure of the air jet may be used to close a switch instead of to open it.

833,914 Sodium Chlorite as Bleaching Agent

KALLE AND CO. AKT. GES., 25 *Rheinstrasse, Wiesbaden-Biebrich, Germany.*

Describes a textile finishing process in which desizing and bleaching are effected in one operation. In this process, enzymatic desizing agents which are active in a neutral medium at temperatures under 60°C, and substances which split off acid or form an acid only at temperatures over 60°C, are added to the neutral bleaching liquor, the fabric being first impregnated with the cold liquor and then heated up to temperatures where acid is split off or formed, i.e. temperatures above 60°C. In one example cotton fabric sized with potato starch and weighing about 170 grams per m^2, which has a low content of husks and a calico weave of 24/24, is soaked at 20—40°C with a padding liquor containing, per litre of water,

10 grams of ammonium sulphate
5 grams of a non-ionogenic surface-active agent.
15 grams of sodium chlorite
10 grams of a pancreas amylase corresponding to 20 Willstätter amylase units.

The fabric is then squeezed until its humidity content is reduced to 100%, and then heated for 60 minutes at temperatures from 75° to about 98°C, as the case may be. Subsequently and at a temperature of 90°C, the fabric is washed neutral with water or a very dilute washing soda solution (1 gram of washing soda per litre of water) and then dried as usual. An almost complete bleaching effect and good desizing of the fabric result.

834,055 Loom Drive

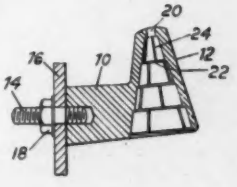
A. F. CRAIG AND CO. LTD., *Caledonia Engineering Works, Macdowall Street, Paisley.*

A loom is provided with a control system comprising a pneumatic clutch through which the drive to the loom is transmitted, a main valve set in the normally closed position controlling the admission and exhaust of compressed air to the clutch. A pneumatic brake aids in bringing the loom to rest, a main valve set in the normally open position, controlling the admission and exhaust of compressed air to the brake and a pilot solenoid operated valve controlling the passage of air pressure to operate the main valves. Manually controlled switches are provided by which the energising circuit of the solenoid can be closed to operate the pilot valve, so that the compressed air is delivered to operate the main valves, whereby the clutch is engaged and the brake released. Means are also provided whereby the energising circuit is interrupted if the shuttle fails to enter either of the shuttle boxes, the de-energising of the solenoid resulting in the pilot valve operating to return the main valves to their normal position, whereon the clutch is released and the brake applied.

834,110 Pressing Cops on to Shuttle Pegs

PIN PLUSH LTD., 44 *Caldene Avenue, Mytholmroyd.*

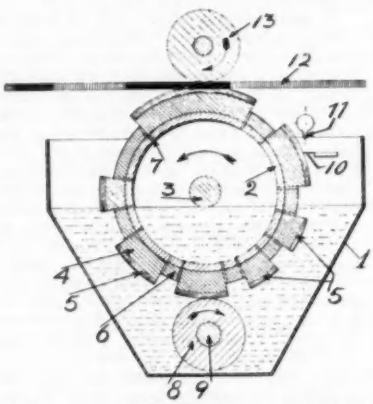
Describes a device whereby a cop can be firmly pressed on to a shuttle peg and whereby the outer conical portion of the cop can be compressed so as to avoid the risk of weft becoming loose. The pressing device has a mounting block 10 and a hollow cop-engaging member 12. A stud 14 is screwed into the block and the stud projects through a bracket 16, there being a nut 18 for locking the device to the bracket. At its smaller end, the member 12 is formed with a hole 20 through



which a shuttle peg can pass, and its internal surface is provided with a series of shallow steps 22 and ribs 24. These steps and ribs assist in gripping the yarn on a cop when the device is in use. In use when the weaver has placed a fresh cop on the shuttle peg, the peg is pushed through the hole 20 and pressure applied to the shuttle, which causes the cop engaging member to push the cop firmly on to the peg, and to compress somewhat the outer end of the cop.

834,123 Improved Printing Apparatus
BRITISH TUFTING MACHINERY LTD., *Whitebirk Drive, Blackburn.*

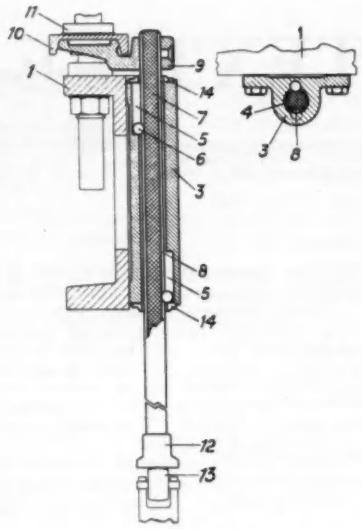
Apparatus for printing on pile fabrics, blankets, felts, towels and raised fabrics and for warp printing, whereby the fabrics can be effectively printed down to the bottom of the material without the printing spreading beyond the contours of the desired pattern elements. A tank 1 contains a dye solution and roller 2 mounted on shaft 3 is partly immersed in the solution. The roller carries a relief pattern formed by elements each having a base 4 of rubber and a pad 5 of cellular material. There are spacers 6 between the elements, and



drain holes 7 passing through the shell of the roller. At the bottom of the tank there is an auxiliary roller 8 on an adjustably mounted shaft 9, the roller 8 pressing against the pads 5 as the roller 2 rotates to remove air and allow them to soak up the solution. A scraper blade 10 and an air jet 11 are provided above the surface of the liquid to remove excess liquid from the surfaces of the pads. The fabric 12 is led, pile downwards, above roller 2 in contact with the pads and a pressure roller 13 presses the fabric against the pads so that liquid is squeezed out of the pads and absorbed by the pile of the fabric.

834,163 Guiding Movement of Ring Rail
L. VELLA, *Cogoxxo Valtrompia, Brescia, Italy.*

A device for guiding the movement of the ring rail in spinning machines, so that rings of greater diameter may be used. On the spindle rail 1 are fixed supports 3 arranged along the spinning frame, each of which has a central hole 4. Grooves 5 of limited length are provided at the two ends of the support and diametrically opposed to the hole, balls 6 are accommodated within the grooves 5. Mounted in hole 4 is a lifter rod 7 in which there are provided grooves 8 which are also diametrically



opposed and which extend over the whole length of the lifter rod. Fixed at the upper end of the lifter rod is a bracket 9 whereon is mounted a ring rail 10 carrying rings 11 while the lower end of the lifter rod carries a small foot 12 which cooperates with the actuating member 13 of the spinning frame and receives its movement therefrom. Small caps 14 mounted at the ends of the support 3 each serves as a closure and end stop for the race in which the balls run.

834,551 Resin Treated Yarns
THE PERMATWIST COMPANY, *P.O. Box* 483, *South Coatesville, Pennsylvania, U.S.A.*

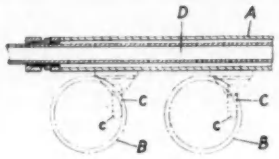
A method of continuously thermally processing resin treated yarn comprises drawing the resin-treated yarn through a heated zone within a regulatable heating device at a temperature at or above the softening or curing temperature of the resin while the yarn is under constant tension, allowing the treated yarn to cool below the softening or curing temperature and winding-up the cooled yarn. The supply of heat energy to the heated zone is automatically regulated so as uniformly to heat the yarn to the required temperature, and to maintain a pre-determined correlation between applied tension and the contractile force of the resin-treated yarn.

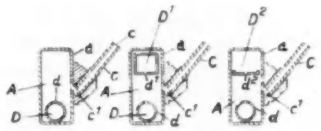
834,582 Screen Printing Machines
COLDEN MANUFACTURING CO. LTD., *Jack Bridge Mills, Hebden Bridge.*

Relates to a screen printing machine of the kind comprising an endless belt which is moved intermittently to carry a web of material, step by step beneath one or more stencil frames according to whether single or multi-colour printing is being effected. The belt is moved intermittently by pusher members which reciprocate in the direction of travel of the belt, and coact with individually adjustable abutments provided in spaced apart relation along each edge of the belt.

834,682 Automatic Ring Lubrication
EADIE BROS. & CO. LTD., *Victoria Works, Paisley.*

Means for supplying directly and intermittently a quantity of fluid to the rings of spinning or ring doubling frames. A number of reservoirs A are arranged on the frame behind the rings B, each reservoir supplying oil to a number of rings. A series of pipes C—one for each ring—are arranged in the front wall *a* of the reservoir at some distance from the bottom of the latter, the outer end *c* of each pipe being situated near the bottom of the corresponding ring at a point on its diameter along the centre axis of the ring plate. Each pipe is shaped to form a trap c^1 in which a small quantity of oil will be trapped when the level of the oil in the reservoir falls below the entrance to the pipe C This trap may be obtained by forming the passages through the tube or nozzle of angular shape. The level of the oil in the reservoir is controlled by a tube D of small diameter and located at or near the bottom of the latter. The tube D

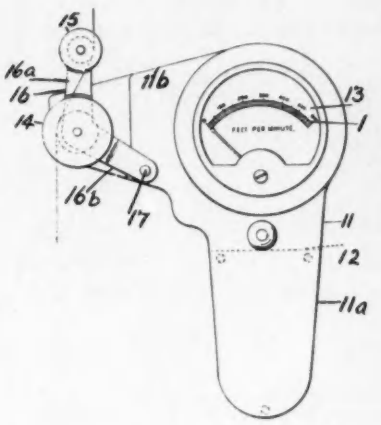


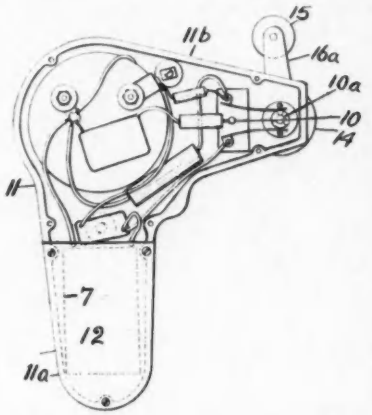


extends for the whole length of the reservoir and is provided with apertures *d* for the passage of the oil. The gas under pressure for forcing the oil to the rings may be supplied directly to the reservoir by a pipe at one end or to prevent surge of the oil contained in reservoir by introducing a gas distribution pipe D^1 with apertures d^1 into the reservoir or alternatively by inserting a partition near the top of the reservoir to form a chamber D^2 to which the gas is supplied, the partition being provided with apertures d^2. The cycle of operations for supplying oil to the rings is, feed oil to the reservoir to raise the level of oil above the entrances to the tubes C to fill the traps c^1, drain sufficient oil from the reservoir to lower the level of the oil below the entrances of the tubes C and so trap a quantity of oil in the traps c^1, and finally supply gas under pressure to the reservoir to force the oil in the traps c^1 to the rings.

835,014 Speed Measuring Devices for Filaments
HOSIERY AND ALLIED TRADES RESEARCH ASSOCIATION, *Nottingham.*

A speed measuring device for measuring the speed of a running filament such for example as a filament which is being spun wound or processed. The device comprises a housing 11, the hollow upright bar 11*a* forms a hand grip by which the device may be applied to a running filament, and contains a removable dry battery access to which is obtained by removal of a cover plate 12. At the corner between the upright bar 11*a* and the cross bar 11*b* there is housed an electric meter 1 the dial 13 of which is visible and is graduated in feet per minute. The horizontal bar 11*b* contains further parts of the electrical apparatus and near its end houses a contactor 10, the spindle 10*a* of which protrudes to the outside of the body and is provided with a grooved pulley wheel 14. Associated with this wheel





there is at least one other filament guide 15 so that the filament may be guided to follow a path in which it runs partly around the periphery of the wheel. The latter is therefore driven by and in effect measures the speed of the filament, and the electrical apparatus is so designed that the meter 1 provides a visual indication of the filament speed, the current for the meter being supplied from the battery 7. This guide pulley 15 is mounted on one arm 16*a* of a bell crank lever 16 which is pivoted about the axis of the spindle 10*a* of the pulley and the other arm 16*b* of which is provided with a finger knob 17. Thus with the guide pulley in a suitable position the device may be so applied to the running filament that the latter is disposed between the guide pulley and measuring wheel 14 and the guide pulley may then be moved by hand so as to engage the filament and to divert the latter from the straight path until it runs partly round the measuring wheel.

835,302 Improved Casablancas Drafting Apparatus

CASABLANCAS HIGH DRAFT CO. LTD., *Bolton Street, Salford* 3, *Manchester.*

A Casablancas drafting apparatus has a lower tensor with a convex upper working surface extending over the greater part of the run of the lower band and serving to deflect the run around an arcuate path so that fibres being drafted are always gently urged against the upper surface of the lower band run. A top band and driving roller are provided, at least one of which is peripherally recessed over its working area so as to decrease the fibre control exercised by the two bands at the nip between the band driving rollers.

835,365 Drafting Units

J. C. AYMERICH, *Paseo del Conde de Egara* 12, *Tarrasa* (*Barcelona*), *Spain.*

In a drafting unit in a continuous spinning machine of the type comprising two flexible aprons retaining the material between them to a point near the nip point of the drafting rollers, the forward guide of one of the aprons is positioned nearer the nip point than the forward guide of the other apron so that during spinning the material travels over a path in contact with one of the drafting rollers before reaching the nip point. The apron whose forward guide is nearer to the nip point of the drafting rollers may be so positioned relatively to the second apron that the first apron forms, in the path in which it accompanies the roving, a re-entrant angle due to the position of the forward guide of the second apron. Due to this manner of positioning the aprons one of the aprons extends to a point very near to the drafting rollers and the path over which the roving travels without being accompanied by an apron is reduced to a considerable degree.

835,398 Cleaning Top Comb on Combers

SOCIETE ALSACIENNE DE CONSTRUCTIONS MECANIQUES, *Mulhouse, Haut-Rhin, France.*

A cleaning device for the top comb of a combing machine, comprises a first resilient blade having a comb-engaging edge in scraping engagement with the comb teeth on one side of the comb and a second resilient blade having a comb-engaging edge in engagement with the teeth on the other side. The first blade is fixed to a retractable feed plate on the machine and the second blade is continuously urged towards the first one, During operation, the second blade is cyclically moved away from the first blade by means of a stop member which is fixed on a part of the combing machine which is non-retractable relative to the feed plate. The stop is positioned behind the second blade when the cleaning portion of the comb-raising stroke has been completed, to prevent the edge of the second blade from following that of the first blade as the latter is withdrawn by the feed plate, the second blade being continuously urged towards the first blade by springs.

835,486 Improved Crimping Apparatus

TEXTURED YARN CO., INC., 4041 *Ridge Avenue, Philadelphia, Pennsylvia, U.S.A.*

A strand-crimping process, comprising forcibly feeding a strand on the run into and through a region of confinement, continuously applying independently of the feeding rate a movable impeding force at a fixed location within the confining region to accumulate the strand continuously during its passage. The leading terminal portion of the strand accumulation is released continuously and uniformly from the confining region while maintaining the following confined portions of the strand accumulation bunched together by the impeding force.

835,609 Top Arms for Roller Drafting

CASABLANCAS HIGH DRAFT CO. LTD., *Bolton Street, Salford* 3, *Manchester.*

Top arms for roller drafting mechanism normally employ a large number of separate short clearers which extend only between adjoining arms and greatly increase the difficulties of handling and supervision.

An object of the invention is to provide a simple and inexpensive top arm having a low compact construction which obviates this disadvantage. The top arm has an inverted channel form with comparatively shallow side walls, and roller holding and weighting units each incorporating guide means depending below the side walls and adapted to straddle a top roller centre neck, whilst leaving the latter free to rise and fall. Retaining means are provided for resisting complete withdrawal from the guide of the roller neck when the latter has been engaged therein, and a pair of symmetrically mounted torsion springs, having free ends which extend lengthwise of the arm, apply the requisite weighting pressure.

835,634 Removing Cellulose-containing Impurities from Woollen Fabrics

ZSCHIMMER AND SCHWARZ CHEMISCHE FABRIC UND GERBSTOFFWERK OBERLAHNSTEIN A.G., 4 - 5 *Alte Braubacher Strasse, Oberlahnstein on Rhine, Germany.*

A process for the removal of cellulose-containing impurities, such as cellulose acetate, regenerated cellulose and natural cellulose, from wool or woollen fabrics, The mixed fabric is treated with anhydrous silicon tetrachloride or anhydrous boron trichloride, with exclusion of moisture. The chloride is afterwards removed from the treated fabric and the impurities removed mechanically from the fabric in such manner that the fibre structure of the wool is retained. In one example, 30 parts by weight of dioxane were mixed with 4 parts of anhydrous silicon tetrachloride, a slight rise in temperature occuring owing to the formation of the addition compound. The addition compound was so dissolved in trichlorethylene that the content of the compound was about 4% by weight. Instead of trichlorethylene, it would have been possible to use perchlorethylene. A mixed fabric consisting of wool, acetate silk and rayon was dipped into this solution in such manner that the bath ratio of fabric to solution was 1:10 by weight. The fabric was treated for 20 minutes at 25—27°C., squeezed and then heated for 30 minutes at 90—95°C. After cooling it was found that the wool had remained unchanged, while acetate silk and rayon had been completely converted into brittle powdery particles which were found to be easily removed from the wool by beating. A sample of the wool treated in this manner was saturated with water, and it was found that the pH value was 6·5 to 7. It was found therefore possible to dispense with a neutralising and washing operation.

835,986 Mounting for Comber Cushion Plate

WHITIN MACHINE WORKS, *Whitinville, Massachusetts, U.S.A.*

Relates to combers of the Heilmann type with the provision of an improved mounting for the lower nipper or cushion plate. The comber has a nipper frame including side portions connected by a body portion and having extending pivot means mounted in the nipper frame. A cushion plate support is mounted on the pivots for rocking movement about the axis, and incorporating upper and lower stop faces. The nipper frame body portion incorporating upper and lower stops respectively disposed above and below the stop faces of the cushion plate support to limit the rocking movement. A cushion plate is secured to the cushion plate support.

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